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International Journal of Orthodontia and Dentistry for Children

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International Journal of Orthodontia and Dentistry for Children

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International Journal of
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VOL. 20 ST. LOUIS, APRIL, 1934 No. 4

ORIGINAL ARTICLES

PRESIDENT'S ADDRESS*

SOUTHWESTERN SOCIETY OF ORTHODONTISTS

W. B. STEVENSON, D.D.S., AMARILLO, TEXAS

THIS is the twelfth annual consecutive meeting of this Society. Each successive meeting has seen an increase in membership and a corresponding interest in the programs. The executive committee has arranged a splendid program to be presented during the next three days.

In reviewing the accomplishments of this society we observe first, a high type of orthodontic service rendered in this part of the United States; second, cooperation among orthodontists; third, an unusual spirit of friendship. These accomplishments undoubtedly justify the continuation of this society, and will encourage us to work and study more to improve our present knowledge and to strive to meet the ever changing conditions as they arise.

Many new ideas and principles are brought before us, some to be tried and accepted, others to be discarded. As we contemplate the work done in the field of orthodontia, we find that many useful theories or scientific facts had their germ of origin from some discussion such as we shall have here. Let me urge all members to take an active part in the discussion of papers. You do not have to agree with the essayist. He may be wrong in everything he says, but if he can stir up a lively discussion he has presented a splendid paper. If he has presented some good thoughts, tell him so; it will encourage him to offer other useful papers or clinics. Every one can give a clinic or case report. Who knows but what your clinic may be the beginning of some revolutionary scientific discovery.

In studying the history of the development of orthodontia we find that as the need for corrective work became apparent, the imagination of hundreds

*Read at a meeting held in Amarillo, Texas, January 24-27, 1932.

of dentists, each striving in his own way to find the cause and a way to correct dental deformities. inadvertently created the specialty of orthodontia. We have not begun to solve the problems which were created in the development of orthodontia to its present state. In truth we have scarcely become aware of what these problems may be. During the years ahead there will be many changes, and the men who will be best remembered will be those who most persuasively led us to discover those ways which will enable us to recapture the old ideas and assure us at the same time the enjoyment of the wonders yet to be.

We turn through the journals and read only those articles with which we agree, or go to a meeting and listen only to those papers on subjects on which we have already formed an opinion.

Harry Emerson Fosdick says in part, "We, the American public, run into two main dangers. First, we read carelessly, letting any casual straggler down the literary street buttonhole us and waste our time while kings are waiting; and second, we read what we agree with, what suits our mental palate, and what, therefore, merely confirms our previous opinions instead of provoking us to think something new.

"Standardization of opinion and conformity of mental patterns are to the individual the death of intellect and to society the end of progress. Anything that will break this up, force us to face new facts and new ways of judging new facts, is of first rate social value.

"At least we owe it to ourselves to acquaint ourselves with the best that is current in the thinking of our times, and especially with any intelligently conceived opinions that differ from our own."

In addition to the study of orthodontics, we, as orthodontists, are business men whether we like to admit it or not, and as such we must give some thought to economics if we are to succeed. Peace of mind is essential to the professional man, and the comfort and happiness of his family are essential to his peace of mind. Our profession places us in a peculiar position in this respect. Our education and training, together with the establishment of practice, represents an outlay or investment of money, time and effort that would surprise the average person. In addition to all this if we are to keep abreast of our profession and maintain the high standard of our practice, we must continue to devote much time, study and money to it. It is a never-ending job.

Such a concentration should be richly rewarded, but is it? Let us consider what happens when the long years of service have so depreciated our strength and energy that we must retire from active work to rest and enjoy peacefully the comparatively few remaining years left to us. What becomes of our practice then? What does it provide for us? Exactly nothing. When we leave our offices for the last time, our income therefrom promptly ceases; it is without further value to either ourselves or our estate beyond the little that may be realized from a moving van full of books and equipment. When Bosworth began his lectures on economics, many of us did not agree with him, but he started us to thinking, he provoked us to think something new. I dare say there is not a dentist anywhere who has not benefited from these lectures.

The past year has been a trying one; to many of us it has brought disappointments and financial tragedies. But there is some good in everything. An old fundamental law of life has been brought into exercise, "Every living thing grows and strengthens through the medium of stimulus, irritation, service, growth through function."

To the average individual, the experience that wounds, irritates, shocks, or has tragical implications, is a stimulus to increase efficiency and the capacity to serve. It promotes vitality and facilitates survival. We shall be better prepared for the next depression when it comes, and it is my belief that in the end we shall be healthier, wealthier, and wiser from this experience.

REPORT OF COMMITTEE ON THE PRESIDENT'S ADDRESS

We feel that the high standard of orthodontic service referred to by the president as one of our accomplishments is a recognized fact, and that much of the credit is due to this society for its service in disseminating ideas and unifying technic. Concurrently with this are the cooperation and the friendship developed among our members.

We concur with the president's remarks of encouragement to members to participate in discussions and in the presentation of clinics and papers. Especially is the function of this society as a training ground of younger men to be kept constantly in mind.

His plea for an open mind, and for the practice of informing ourselves of the opinions of those with whom we do not already agree, is well taken.

That economics is an important study for orthodontists is true, and the committee especially endorses, in connection with this idea, the splendid address presented by Dr. Dewey on "Ethics and Economics" at this day's session. The value of peace of mind and contentment both while pursuing our vocation and after old age overtakes us, is linked with proper compensation and provision for material needs. We should have foremost in mind that we are working for humanity, but we should not forget that our families also are human.

While the address advocated no reforms or radical innovations, yet it showed in its composer an understanding of the problems with which we are all faced today, and was both helpful and encouraging.

This address breathes the spirit of the man, his sincerity and devotion to the best ideals of the profession.

HOMER B. ROBISON,
W. T. CHAPMAN,
LOUIS S. WINSTON.

THE INFLUENCE OF PRESSURE ON OSSEOUS GROWTH AND FUNCTION*

JOHN T. GRAY, M.D., AMARILLO, TEXAS

IN MOST procedures used by orthodontists and orthopedists to correct osseous deformities, some form of pressure is resorted to. In so doing a scientific rationale of treatment is utilized based on the physiology of bone. Frequently the causative factor of the distorted bone, which we attempt to correct, is an altered application of direct or indirect pressure.

That bone responds to such stimuli as pressure, stress, tension, and negative pressure, cannot be questioned. Wolff's law, formulated in 1892, and known as "The Law of Bone Transformation," is based on observations in the osseous skeletal system of the changes in structure, architecture and form, the result of altered function and of pressure changes. Briefly, this law states that external form and internal structure of bone change with every alteration of function. It is a proved fact that if the forces which a bone is called on to resist are increased, the bone hypertrophies and becomes stronger. This would indicate that the normal weight-bearing and the balanced muscle pulls have a great deal of influence in the normal growth of the skeletal system. Hence our concept of the osseous system is that of a semirigid pliable supporting frame for the soft tissues of the body, easily influenced by the innumerable pressure changes, the result (1) of functional or nonfunctional muscles, (2) as a sequel of pathologic processes, and (3) due to external forces.

An exhaustive discussion of each of these factors causing pressure changes either directly or indirectly, and thus influencing the osseous growth and function, would require a voluminous paper. For our purpose, it will suffice to recall to mind the authoritative opinions concerning the influence which pressure has on osseous growth and to illustrate each group as outlined above.

PRESSURE CHANGES DUE TO FUNCTIONAL MUSCLES

Let us consider a case of structural scoliosis. We are confronted with a definite lateral lumbar deviation, and frequently in many cases, to complicate the picture, there is a definite rotation of the vertebrae. Until recently, the etiology in such cases has been all but baffling. Eben J. Carey[1] in a recent issue of the *J. A. M. A.* has thrown much light on the mechanism of production of structural or idiopathic scoliosis. He believes that scoliosis is a spinal sign of the imbalance of muscle and bone growth of the motor system of the back and that it is not a specific disease entity, and further, that the kind and degree of scoliosis are dependent on the extent of the imbalance, caused by the weakening and possible paralysis of multiple combinations and permutations of the muscle groups of the body as a whole. That in chronic infantile

*Presented before the Southwestern Society of Orthodontists, Amarillo, Texas, January 24-27, 1932.

inanition and malnutrition there is an asymmetrical decrease in muscle weight and a persistence in skeletal growth in length. This results in unequal pull on the spine and the striking of an abnormal muscle-bone balance which in turn results in the deformity of the spine, and function is correspondingly diminished.

In considering the paralytic scoliosis, due to poliomyelitis anterior, where there is extreme involvement and flaccid paralysis of whole groups of muscles, the pathogenesis of the curvature is obvious. There is a gross imbalance of the motor system and complete loss of antagonistic muscle groups, and the resulting component of forces plays havoc with the pliable, flexible vertebral bodies. Once the normal dynamic equilibrium has been disturbed, the pressure changes demonstrated in a roentgenogram of the spine, namely, wedging, rotation and osteoporosis, quickly follow.

A further example of the influence of pressure, using the term in its broadest sense, is that of retarded growth in extremities, the result of infantile paralysis. As a result of the flaccid paralysis and inactivity of the muscles, we frequently see an extremity one, two, and three inches shorter than its fellow and distinctly smaller. Atrophy has occurred and the bone is lighter in weight, smaller in diameter, and weaker than a corresponding normal bone. On section, the bone is found to cut with more ease, and the cortex is thinner than normal, while in the cancellous portion the trabeculae are decreased in size and number. This, in a measure, may be accounted for by impaired circulation to the member, but a more scientific explanation is the absence of the necessary stimuli supplied by the muscle tone and function during the growth period. Roux (quoted by Dr. Key[2]) "believes the form and structure of bone is the result of the forces exerted upon them by the muscles and surrounding viscera, and the inherent tendency of the bone anlage to develop in certain directions is nonexistent." Like Dr. Key, "I believe this is carrying the theory of functional adaptation to extremes, but there can be no question that bones do have the capacity of responding to stimuli, and that their growth may be influenced by forces within the organism."

Before leaving this important phase of the subject, I need only to remind you of the many helpful articles written on the relationship of functional muscles in the etiology and correction of dental anomalies, by Dr. P. A. Rogers of Boston, Dr. Martin Dewey of New York, and Dr. H. B. Robison of Hutchinson, Kansas.

PRESSURE CHANGES THE SEQUELA OF PATHOLOGIC PROCESSES

Walking the streets of any city of any size in this country and abroad, we see the hunchback, a tragic picture of a distorted human being, because of some one's neglect—neglect of what? Of the simple fact that diseased pathologic bony tissue must be protected from the pressure of superimposed body weight. At some time in each of these cases the tuberculosis bacilli invaded the bodies of one or several vertebrae, and as soon as nature stopped the acute active process by walling off the infection, the pain began to subside and the patient was allowed to get up. With the superincumbent weight of the upper trunk applied to the honeycombed vertebral bodies, what else can

we expect but eventual collapse and gross deformity at the site of the pathologic condition, with grossly impaired function?

Another deformity the orthopedist frequently sees, which is the direct influence of pressure concomitant with a pathologic process, is that of genu varum, or bowlegs, in the rachitic child. Less frequently, genu valgum, or knock knee, results from the same cause. The deformities of rickets occur in response to mechanical causes, as the result of the softening process of the bone, resulting from imperfect deposition of lime. In the correction of such deformities, if they are seen early, we rely on pressure in some form, applied either by daily manipulation or by braces exerting a constant pressure, with therapeutic measures to combat the rachitic process.

Phemister's[3] work demonstrated the solvent action on cartilage of proteolytic enzymes liberated by polymorphonuclear leucocytes in acutely infected joints. He showed that the extent of cartilaginous dissolution is directly proportional to the length of time the enzymes remain in contact with the cartilage and that destruction is hastened by the intraarticular pressure and friction. His observations have been generally accepted and are a logical basis for intelligent treatment; such treatment being (1) to empty the joint as soon and as completely as possible, and (2) to relieve intraarticular pressure and friction from muscle spasm by fixation and traction. Both measures we see are directed at the relief of pressure.

I recall a case of hemangioma of the tongue which helps to illustrate the influence of pressure on bone growth. This patient was born with a nevus or vascular tumor involving the entire tongue. Growth was slow but constant, and at the age of eight years when I first saw the patient, it had reached the size of an orange. Examination revealed a tumor mass intimately connected with the tongue and completely filling and protruding from the mouth. Just anterior to the first mandibular molars the angle of the mandible turned sharply downward, and there was an excessive open-bite of at least one inch. Constant pressure of the tumor as it protruded from the mouth and impaired function of the tongue, necessitating forced efforts on the part of the patient to take nourishment, caused this deformity. Relief was given by surgical removal of the hemangioma, but the deformity of the mandible persisted.

THE INFLUENCE OF EXTERNAL FORCES

Trauma.—There are several affections of bone the etiology of which are not definitely known; however, a history of trauma is usually obtained, and many physicians consider trauma as an etiologic factor. Among these affections we encounter a condition developing subsequently to a spinal injury termed Kümmell's disease. The history usually given is that of a mild injury to the spine with no immediate symptoms. Because of an absence of symptoms at the time of injury, rarely are roentgenograms made. Symptoms do manifest themselves, however, some weeks or months later, and the patient complains of pain at the site of the lesion and a gradually developing kyphos, simulating tuberculosis of the spine. As I have said, there is doubt as to the exact etiology; some authorities claim that the pathologic changes are

due to unrecognized fractures, with softening of the resulting callus from too early resumption of functional activity. Roentgenologic studies reveal one or more vertebral bodies, usually dorsal vertebrae, definitely wedge shaped and presenting increased density. Regardless of the primary factor in its production, Kümmell's disease is a manifestation of the influence of pressure on the bodies of the involved vertebrae.

There are a number of other conditions, such as epiphyseal coxa vara or displacement of the capital epiphysis of the femur, Osgood-Schlatter's disease of the tibial tubercle, Koehler's disease of the tarsal scaphoid, and Legg's disease, occurring in children and adolescents during the maximum growth period, which we have collectively grouped under the term osteochondritis. By this term we imply a noninflammatory derangement of the normal process of bony growth occurring at various ossification centers. Lesions having similar characteristics have been described by various authors, involving practically every ossification center that is subject to pressure and strain. Of the numerous theories as to etiology, such as syphilis, early tuberculosis, late rickets, aseptic embolism, all have been discounted, and many have felt that mild trauma plays an important part in the causation of these disturbances. Buchman[4] is of that opinion and states that, "Mau has pointed out that rapidly growing bone cells are physiologically weak. If, at the time of rapid growth, a static imbalance occurs either from an increased stress or strain or from a decreased capacity to withstand stress or strain, a derangement of the normal process of growth occurs giving rise to compression fractures and irregularities in growth."

Ferguson and Howarth[5] in a study of seventy cases of slipping of the upper femoral epiphysis observed that 65 per cent of the patients were overweight with flabby, weak musculature. Many gave a history of rapid growth in height and weight just prior to the onset. Seasonal activity—the period of vacation and of football playing—seemed to have some relationship, since 66 per cent of boys had onset of the disease and 70 per cent had onset of the displacement. They were of the opinion that impaired circulation was the more probable etiologic factor but admitted that trauma hastens the onset of symptoms and initiates or increases the displacement. Little is known of the pathology of the entire group of affections collectively termed osteochondritis. The epiphysis bears the brunt of the pressure and reacts by an irregular widening of its cartilage proliferating region. The diaphysis shows an increase of spongy, bony growth on its concave side and absorption and fibrous tissue formation rich in giant cells on the convex side. As the condition advances, hemorrhage and necrosis—evidence of trauma and pressure—become more and more marked.

The roentgenographic appearance of the various forms of osteochondritis is very similar. The epiphyseal line is consistently widened, there are areas of rarefaction and condensation, and the outlines are indistinct, giving the picture a hazy, mottled appearance.

The condition is self-limited, being terminated on the completion of ossification. Prior to this time the affected bone should be protected from pressure, in an effort to prevent further deformities.

Faulty Posture.—Abnormal positions of the body may give rise to forces which alter the normal development of the skeletal system. We have only to recall the distorted feet of the Chinese women from constant bandaging over a period of years to prove this statement.

Wullstein[6] showed, by bandaging young dogs for months in positions with the spine bent laterally in some and convexly backward in others, that a permanent bony deformity occurred which could not be removed by traction after death. A section of these columns showed wedge-shaped deformity of the vertebrae with a "lipping" or overgrowth of the borders on the concave side of the curve, the trabeculae being thickened on the side of the bodies toward the concavity.

A theory generally advanced in explanation of congenital dislocation of the hip, where there are no associated primary anomalies, is that the excessive flexion and adduction of the lower extremities in utero act as a lever thus forcing the head of the femur out of the acetabulum. Favoring this view is the fact that very often children with such displacement hold their legs in a position of accentuated flexion for a while after birth. Being cognizant of the varied position the fetus may assume in utero, and keeping in mind the length of the extremity in relation to the shallow acetabular cavity, I believe such an explanation of congenital dislocation of the hip is plausible.

All of you are acquainted with the work of Dr. Harvey Stallard[7] in the etiology of dental anomalies, especially malocclusion. He believes that many of these cases may be caused by extraoral pressures, such as hand, arm, forearm, and shoulder pillowing, thumb-sucking, chin-propping, cheek-resting, et cetera. To what extent his theories have been accepted, I do not know, and while I may not be qualified to express an opinion, nevertheless, I believe his theories are sound and are based on a knowledge of the plastic and adaptable structure of bone.

Corrective Therapeutic Appliances.—We all use in our daily practice appliances designed to exert pressure in the correction of deformities. The orthopedist relies on braces and plaster of Paris, while the orthodontist has numerous dental appliances designed to exert pressure in tooth movement. What is the reaction of bone to this pressure?

Briefly, the consensus of opinion of research workers in this field is that bone resorption occurs during the period of pressure and that bone repair and hypertrophy occur during the intermissions when pressure is relieved. Key[2] sites examples of both hypertrophy and atrophy as the direct cause of pressure. Oppenheim[8] in a most convincing article on "Bone Changes During Tooth Movement" presents experimental proof that pressure is the sole explanation of tooth movement. As to the histology of the contiguous bone, he believes that resorption occurs first, and later the signs of absorption disappear, and repair and new deposition of bone occur. Roux[2] believed that the direction of the force was important and that pressure on a periosteal covered surface causes atrophy while that on a surface covered by cartilage does not. So we see there has been no satisfactory answer to our question. Various phe-

nomena are known to occur, and clinically we can demonstrate them, but a wide experimental field is waiting for the orthodontist who chooses to work with experimental animals and to study the material after various orthodontic procedures have been carried out.

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TUBERCULOSIS IN CHILDREN*

J. B. McKnight, M.D., Sanatorium, Texas

THE disease we now call tuberculosis has been recognized in mankind for many centuries. Even Hippocrates (460-357 B.C.) described this disease in his patients. The cause of tuberculosis, however, was not definitely known until Dr. Robert Koch, a German physician, discovered the tubercle bacillus in 1882. Koch's discovery led to two very important observations:

First, that tuberculosis is produced in man and other animals by the implantation of germs—tubercle bacilli—and is not inherited as was previously supposed.

Second, that tuberculosis is a communicable disease.

Using Koch's discovery as the beginning point in our tuberculosis work we have made astonishing progress in ridding mankind and our domesticated animals of this disease. At first our efforts were directed largely to the care of the tuberculous patient, but in later years the program has been extended more and more to the prevention of the disease by teaching the nontuberculous part of the population how to avoid having tuberculosis.

As a result of our work the death rate caused by tuberculosis has been reduced from about 200 deaths annually for each 100,000 population in 1900 to the present rate of 72 deaths annually per 100,000.† The actual number of cases of active tuberculosis has decreased very greatly as the death rate shows, even though today we have more known cases of the disease on record than ever before. This seemingly strange condition is due to improved diagnosis. Both laymen and physicians are suspecting the disease much earlier than in former years, hence, many persons with early or beginning tuberculosis are now diagnosed accurately and treated who would have been overlooked years ago. We know from autopsy findings, x-ray examination, and physical examinations that Nature heals many cases of clinical tuberculosis spontaneously. But since we do not know which ones Nature will heal spontaneously we advise all persons who have active disease to take a rest cure and in that way help Nature to heal the disease.

It is said now and, in fact, I believe there are many children infected now by the fathers and mothers, the grandfathers and grandmothers, the uncles and the aunts who had a cough for twenty years and thought it was bronchitis or asthma, although they had tuberculosis. If they had known that, they probably could have prevented tuberculosis in the family. There are more known cases now infected along that line than from all the open cases we know anything about.

In our studies of tuberculosis in the adult we have found that a large percentage of the cases are the result of infection acquired in early childhood.

*Read at the Thirty-Second Annual meeting of the American Society of Orthodontists, Oklahoma City, Okla., Nov. 8-10, 1933.

†National Tuberculosis Association.

These childhood infections and their glandular involvements had healed years before and had lain dormant, but had become active again because of the patient's lowered resistance. Because of our views just stated, our work in the control and prevention of tuberculosis has changed greatly during the last twenty years. We are now trying to protect children from having intimate contact with *open case* tuberculosis, and we are teaching and training infected children and their parents to avoid the disaster of active pulmonary tuberculosis.

The initial parenchymatous infection observed in tuberculous children, if slight, almost always calcifies, leaving, however, a dormant infection in the lymphatic structures draining the parenchymatous lesion. It is this semi-dormant infection of these lymphatic structures with which we are chiefly concerned in this paper. American children do not have tuberculosis in the glands of the neck, "scrofula," as European children do or even as American children did when I was a child. This is because our dairy cattle are relatively free from tuberculosis. We are indebted to the veterinarians largely for this improvement.

Since we are primarily interested in recognizing and combating the infection before it becomes generalized, the discussion will be limited to the signs and symptoms manifested by uncomplicated early cases of childhood tuberculosis. Before proceeding further it is well to differentiate between what we tuberculosis physicians call "adult" form of tuberculosis and "childhood" type of tuberculosis as defined by the National Tuberculosis Association:

CHILDHOOD TYPE	ADULT TYPE
Usually occurs in children but may rarely occur in adults.	Usually occurs in adults but may occur in children. Result of reinfection. Usually in upper lobes.
Result of a primary infection.	Tracheobronchial lymph nodes not involved in reinfection.
May involve any part of lung.	Caseous lesions followed by excavation and fibrosis.
Tracheobronchial lymph nodes always involved.	
Caseous lesions usually become calcified.	
Excavation is very rare; little tendency to fibrosis.	

In taking the history of a child suspected of being tuberculous it is necessary to determine first of all whether he has had intimate association with a chronic cougher and, if so, how long. Occasionally we see a small child who has lived for several months or years in the house with an adult who has germs in the sputum that has the adult or pulmonary type of the disease. In children so afflicted the prognosis is very unfavorable.

I do not believe the child under ten or twelve years that develops an adult tuberculosis with a positive sputum will get well. I wish somebody could make me believe something else. I handle these patients and I love them to death, but they will not get well.

The history also should include the source of the child's milk supply. There are two routes by which tubercle bacilli gain entrance into a child's

body: They may be swallowed or they may be taken into the lungs by inhalation. Modern times have brought to us the testing of dairy cattle for tuberculosis and the pasteurization of milk. These sanitary measures have done much to reduce childhood infection through the gastrointestinal tract so that now tuberculosis infection by inhalation is the source with which we are chiefly concerned.

Possibly the most frequent symptom found among tuberculous children is fatigue, commonly manifested in a disinclination to play.

The tuberculous child is usually underweight for its height and age. This is not often due to its having lost weight, although loss of weight is found in advanced cases, but is due to its not having made the normal gain. A few tuberculous children have normal weight when diagnosed and occasionally we find one that is actually overweight.

Tuberculous children do not usually cough or expectorate except from colds and they seldom complain of pleurisy. The diagnosis of tuberculosis in children is not often made by the evidences of lung tuberculosis as they appear in the adult, simply because children seldom have the disease in this form.

Tuberculous children, like tuberculous adults, are likely to be restless and irritable.

Tabulation of the symptoms of 1,000 children admitted to the State Tuberculosis Sanatorium during the past three years, between the ages of six and fifteen years, for preventorium treatment, revealed that 289 of them voluntarily complained of fatigue and 141 more on direct questioning admitted they had loss of strength.

Approximately 240 of these children had fickle appetites and were conscious of indigestion.

Intermittent cough, probably due to upper respiratory disease, was found in 200 of these children. For the most part the cough was dry and unproductive.

Local sweating due to vasomotor instability, and nervousness was found in practically all the children.

At the time of their admission 320 of these children showed elevation of temperature ranging from 99 degrees to 100 degrees or more.

Only nine showed hemoptysis by history or by actual observation in the sanatorium. The absence of chronic cough, pleurisy, and blood spitting was a noteworthy feature in these children.

Tubercle bacilli are rarely found in the sputum of children except in far advanced cases. Of our 1,000 patients tubercle bacilli were found in only 8, and these children were hopelessly ill.

The records show that 362 of the children were without marked symptoms; these children had lived in the home with adults who had tuberculosis, and the diagnosis had been made largely by means of skin tests and x-ray plates.

The dental examination of these children showed that approximately 65 per cent of them had some degree of malocclusion and that about a third of these children had cavities in their first permanent teeth.

Three questions immediately arise. Is this faulty dental development a direct result of tuberculosis? Is the faulty dental condition a causative or

contributory factor in the child's having clinical tuberculosis? Are both the dental defects and the tuberculosis dependent upon faulty nutrition and possibly some embryologic fault of development? There are of course many things to be taken into consideration in answering these questions.

Students of heredity tell us that a person may inherit the size and form of the teeth from one side of his ancestry and the size and form of the jaws from the other side of his ancestry. Hence, if one inherits large teeth from one parental tree and small jaws from the other, the teeth will be crowded and overlapped; and if one inherits small teeth from one family tree and large jaws from the other, the teeth will be too far apart. There is apparently a great deal of truth in what has just been said.

Knowledge as to the inherent quality of the teeth has been developed much during the past few years. Dr. Albert Robin of Paris taught more than thirty years ago that both tuberculosis and dental caries are likely to flourish when there is calcium deficiency in the body. More recent studies relative to vitamin deficiency and the excessive elimination of lime as a cause of dental caries are only a more detailed development of Robin's theory.

We have thought for years that nasal obstruction, notably adenoids, changes the shape of the maxilla, makes the maxillary front teeth protrude, and gives rise to an appearance known in medical literature as *adenoid facies.* We have believed too that this defect is injurious to the child's physical and, to some extent, its mental well-being. It appears to me logical then to conclude that malocclusion of the maxillary and mandibular teeth is probably due to three things, namely, *inheritance, nasal obstruction,* and *malnutrition.* Tuberculosis is probably only a coincidence or is, perhaps, due to the child's lowered resistance. It is at most only an effect rather than a cause of dental malocclusion.

But whether there is any relationship between dental malocclusion and childhood tuberculosis other than coincidence or not, I take this opportunity to commend you for your interest in the matter and to encourage you to continue your observations and study of the subject. I want to review briefly some of the ideas I have found in dental literature that are more or less related to this subject.

Dr. C. D'Alise, in 1922 before the European Orthodontological Society, reported a four years' study on 206 children in an orphanage who had been medically examined, including Wassermann and Pirquet tests, of which 146, or 71 per cent, were affected by malocclusion.

Dr. Bernard J. Cipes of Mt. Vernon, New York, reported in 1926 the results of oral examinations on more than 1,000 patients at the Montefiore Home, Bedford Hills, N. Y. He found the mouth hygiene to be bad and dental infection common among the children examined.

Dr. T. W. Powers, dental surgeon at the two Connecticut State Sanatoriums, reported that the teeth of the majority of the children were in bad condition. He states that caries of the teeth was very common, that permanent molars with exposed and gangrenous pulps were present to an astonishing extent, that there was faulty enamel formation, and, in some cases, extensive pyorrhea. It was Dr. Powell's opinion that dental disease occurred to a greater extent in the mouths of tuberculous patients than in the mouths of

patients of similar social standing in ordinary life. He found the most abnormal condition in the mouths of tuberculous children to be malformed teeth. He further stated that 90 per cent of all tuberculous patients suffered from dental disease.

Wm. M. Gardner, resident dentist of the Trudeau Sanatorium, related in an article published in 1926 in *The Journal of the Outdoor Life* that a routine dental examination of 500 patients, most of whom had moderately advanced disease, showed that 90 per cent had unhealthy gum conditions ranging from a mild inflammation of the gum tissues to pyorrhea so marked that the removal of all teeth was advisable.

Because of the prevalence of faulty oral conditions found in tuberculous patients I think it very wise for every dentist to insist that all children and adolescents with bad teeth, such as have been described in this paper, to have a physical examination by a physician competent in this work for the purpose of detecting any hidden tuberculous disease that may be present. This is especially important if there is any suggestion of tuberculosis in the patient's family and personal history or in his feelings.

Getting well from tuberculosis is a very difficult problem that requires months of treatment for the case diagnosed early and years for the more advanced patient. The treatment of the tuberculous child is largely a matter of rest and nutrition. Good teeth and a clean mouth are important factors in good digestion and the patient who has a bad oral condition is most certainly faced with a handicap.

DISCUSSION

Dr. L. J. Moorman, Oklahoma City, Okla.—For at least twenty-five years I have been intensely interested in tuberculosis. For fifteen years I have followed very closely tuberculosis in children. We have handled through the Oklahoma City Tuberculosis Free Dispensary 1500 tuberculous children in the past fifteen years. We usually have under observation 300 to 500 children who have been in contact with tuberculous parents or at least some one who has had open tuberculosis.

I cannot say that I have noticed any particular relationship between tuberculosis and dental defects. However, if you notice in your work (perhaps I have been derelict in my duty; perhaps my observation has not been what it should be) there is an increased percentage of cases in the tuberculous children, I wonder whether it might not be due to other factors rather than due to the tuberculosis, per se.

In our experience, tuberculosis, as Dr. McKnight has told you, is very prevalent, and a large number of children by the time they are twelve years of age are infected. Some of them have clinical tuberculosis, many of them do not. It is our experience that clinical tuberculosis or the evil effects of tuberculosis among these infected children are more likely to be noticed in the children who have not had a chance from an environmental standpoint. They are children coming from the homes of the poor, as a rule, where personal and household hygiene are poor and where dental hygiene is not having attention. Then we might argue that the people who are not getting on in a material way, who are not capable physically and mentally of getting on in the world, might be more liable to transmit hereditary deficiency. It may be that is a factor if you find dental malocclusion and other defects among tuberculous children. I doubt whether tuberculosis as a disease is a contributing factor.

However, we must not lose sight of the fact that the medical profession and dental profession have this common problem or question constantly in mind when it comes to tuberculosis and dental problems. That is the metabolism of calcium. We know so little

about it. The calcium content of the blood is not easily influenced by anything we as physicians can do for the patient, even in the way of giving medicine or arranging diet. We do not seem to be able to influence materially the calcium content of the blood, and yet as physicians we feel that calcium has something very vital to do with the healing of tuberculosis.

Dr. McKnight will bear me out when I say that most of the children who show massive infection and still have the childhood type of tuberculosis, even though they may have symptoms and some clinical evidence, going on constantly with the fibrosis or healing, the deposit of calcium in these lesions usually makes us feel pretty good when we inspect x-ray pictures of children who are suffering from tuberculosis and see that these calcium deposits are accumulating about the tuberculous lesions.

This may have some bearing upon your problem. We have tried to influence the calcium content of the blood, thinking we might hasten the healing of tuberculosis that way. I am not sure we have accomplished anything in that respect.

Dr. Henry Hoffman, Denver, Colo.—I should like to ask Dr. McKnight what, in his opinion, is the prognosis for orthodontic treatment of children and young people afflicted with bone tuberculosis or pulmonary or glandular tuberculosis.

Dr. Homer B. Robison, Hutchinson, Kan.—Going back to endocrines, which is my hobby, I was noticing in reading some of the volumes on that subject that Holmes referred to the hebephrenic type of dementia precox which attacks the younger individual, and Dirkin and Ellis found that the deficiency or hypo condition of the suprarenal glands was just as identical in those types of cases as in tuberculosis.

The average case of hebephrenic dementia precox is that which becomes so in school. Usually, the inception of this condition, as I understand it, is during the adolescent period.

I was interested in Dr. McKnight's reference to the difference between infantile and adult tuberculosis. Unquestionably, then, the infantile tuberculous condition is probably exaggerated. I hope you will correct me if I am wrong. Is that exaggerated during adolescence? Because of the fact that the suprarenal gland is closely related to the sex condition and the change at the time of puberty, I was wondering if that would probably have that connection.

You said that we know, of course, it is not hereditary, but does not the child inherit a predisposition? Certain types of individuals are more susceptible to tuberculosis than others.

Another thing that I thought quite interesting was that it was possibly due to lowered resistance. Could not this lowered resistance be due to glandular deficiency?

Those are just a few of the questions that were brought up.

I certainly appreciate this presentation, and I think there is nothing probably in the field of medicine that will do the orthodontist any more good than observing tuberculosis cases and conditions. I think unquestionably we are treating a lot of patients who have at least potential tuberculosis. I do not know whether that would be the proper term or not, but since he has defined it as infantile tuberculosis, possibly we are treating many cases of that type, and that is probably the cause of many of my failures.

Dr. Herbert I. Margolis, Boston, Mass.—I should like to ask Dr. McKnight whether, in his experience, he can verify this statement: Several years ago I was taught that the orthodontist and dentist had the opportunity of recognizing incipient tuberculosis in this way: that children who have early tuberculosis sometimes manifest it by high color and slightly increased temperature, which caused all the organic actions to increase or hasten a little bit, and consequently the eruption of teeth was a little earlier than it should be.

In the time I have been in practice, I have had two children who presented some symptoms. They were the brightest kids in the neighborhood and seemed to be the best youngsters. Their teeth erupted quite early, as we understand the average variation of

eruptions. When they presented, the physician said they were in the early stages of tuberculosis. I wonder whether the early stage of tuberculosis is manifested by early eruption of teeth.

Dr. J. B. McKnight.—I wish to thank Dr. Moorman for the excellent discussion of my article. It pleases me very much to know of the good work being conducted through the Oklahoma City Tuberculosis Free Dispensary, and I sincerely hope it may be continued.

As to the question by Dr. Hoffman concerning prognosis of orthodontic treatment of children and young people afflicted with bone tuberculosis, I have had very little experience, except in a general way, with bone and joint cases of tuberculosis. We have in our state in connection with the John Sealy Hospital at Galveston, an institution for treating children suffering from the so-called surgical types of tuberculosis (bone and glandular). As a rule, tuberculous children and adults should be treated for any complication that may arise which tends to aggravate their diseased condition, provided the shock and discomfort of the treatment do not offset the good results.

In regard to the question by Dr. Robison, the study of endocrinology is one of the most interesting subjects in medicine. It is my belief at the present time that further study of this subject will reveal to us many unknown facts concerning the etiology and prognosis of all the chronic and many of the acute diseases affecting mankind. I am especially interested in the adrenal gland, since I feel, from purely a presumptive standpoint, that deficiency of the secretions of this gland may possibly account for many of the symptoms of tuberculosis, both in adults and in children. You of course are familiar with the theory that Addison's disease is due to an infection of the adrenal gland.

As to the question concerning a child's inheriting a predisposition to tuberculosis, it is our belief that proper food and proper environment, without an opportunity to contract a massive tuberculous infection, will prevent any child, regardless of his predisposition, from developing a clinical case of tuberculosis.

As to the question asked by Dr. Margolis concerning patients with abnormal temperatures, we of course know that the majority of well-developed cases of childhood tuberculosis run a low-grade fever which in all probability is associated with, or possibly caused by, an increased metabolic rate of all organs of the body. It is highly possible and probable that this condition is associated with an early eruption of the teeth. This brings up a very interesting problem, the solution of which would offer a definite contribution to medicine in general and to the study of orthodontia in particular.

Tuberculosis does not occur actively in a well individual. There never was a man, woman or child with active tuberculosis who was well. They have to be below par to develop tuberculosis. You and I have been looking all these years for somebody to discover a specific form of treatment which can be injected with a hypodermic syringe. You and I have not time to be sick over a period of six months or one or two years.

The well man or woman cannot have tuberculosis. Stay well and take care of your children. It is not a disgrace to have tuberculosis, but it is a shame to die of it.

THE CRISIS IN ORTHODONTIA*†

Directions for the Practice: Does the Use of Continuously Acting Force Guarantee the Best Biologic and Clinical Results?

Albin Oppenheim, Vienna, Austria

(Continued from page 258, March)

ALL of the many publications on the lingual arch deal exclusively with the success and the superiority of this method over everything heretofore considered, with "the great advantages of continuously acting forces as compared to intermittent action (Angle arch)," and with all the benefits of this method which I have mentioned in the first chapter of this treatise.

It is frequently stated that "the lingual arch is a relatively harmless appliance, for if carefully applied no great harm can be done even in the hands of rather inexperienced operators." (A. M. Schwarz.[35])

Wongtschowsky[36] states concerning the movement of the posterior teeth in a sagittal direction that "nowadays there is nothing that can compare to a finger spring in producing the desired power in such a case."

Oppler[37] says of the lingual appliance that "it proceeds at an almost snail-like pace; it is by far the most delicate appliance. . . ."

Salamon[17] in his well-known monograph raises a hymn of praise in appreciation of the lingual arch.

These are but a few of the many similar statements found in European orthodontia literature.

Compared to these definite and consistently favorable comments, we find relatively few utterances of misgiving; these, however, should be given some consideration.

"With the stress from mastication less frequent and the pressure of the appliance continuous for a long time . . . the force from the appliance being continuous would act as the controlling stimulus." (Mershon.[22])

In his recently published *Text-Book of Orthodontia,* Strang,[38] after analyzing the lingual arch from the physiologic, mechanical, and esthetic-hygienic viewpoints, comes to the following conclusion: "Thus we find this appliance efficient in the following degree: physiologically 80 per cent; mechanically 45 per cent; esthetically and hygienically 70 per cent."

According to these opinions, nearly all of which are favorable, the lingual appliance should really be a wonderful appliance without fault, were it not for the fact that the absence of any failure, or rather the fact that such failures have never been reported, arouses suspicion. The confession of such failures and

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their analysis would prove of no hindrance to the method; on the contrary, our orthodontic failures, as I have already mentioned, are of far greater importance than our successes, that is, providing we trace their etiology; it would mean a tremendous step forward if, at last, we would check that false sense of shame and frankly report our failures, instead of suppressing them. Moreover, besides this infallibility during active treatment with the lingual appliance, we have not so far seen any publication of a relapse, subsequent to treatment.

In American literature a movement is making itself noticed—to acknowledge "the possibilities and limitations of treatment."[39] Perhaps this demonstration and analysis of failures will open more favorable prospects for the future, because the exclusive demonstration of success has already brought itself into discredit: for when all is said and done, too many "successes" have proved after a time to be failures. To assert that one knows no failures would establish such an unusual precedent in the history of orthodontia that, if conclusively proved, it would actually mean the dawn of a new epoch.

Although Korkhaus[40] in general acknowledges "this so justly feared danger of a relapse after successfully attained normal occlusion," yet he states in Scheff's Handbuch,[30] what I consider as a most unusual fact, "that it is most certainly advisable as a matter of precaution to wear a retention appliance for a short time, although our attempts to shorten this period have never so far been disturbed by a relapse." It goes without saying that Korkhaus concludes his treatise in Scheff's Handbuch by saying: "in the future only the new principles of treatment should be applied."

In my previous contribution I mentioned the danger which arises when continuously acting forces are, by some external circumstances, increased beyond their original adequate limitations. The resulting prolonged pressure anemia of the periodontium causes severe damages (absence of bone reaction, disposition of the cement to resorption). The effects of these damages in respect to the further progress of the active treatment, as well as to the permanency of the success already achieved, are still uncertain; and their ultimate consequences, regarding possible damages manifesting themselves many years afterward, are absolutely unknown. In this article I shall present a report of failures when using continuously acting force, so that, on the one hand, this report may really be of use to followers of this method, and, on the other hand, that it may dispel the fictitious idea of the perpetually guaranted biologic action. I shall cite two cases from my private practice and an analogous one from the orthodontic department of the Dental Clinic of the University. At first, however, I should like to refute any eventual blame as to the improper use of the appliances, for two reasons: (1) the length of time used for the treatment, as well as the intervals of treatment, corresponded on the whole to the other cases treated with the lingual arch; no speed records were attempted in these cases; and (2) I claim for myself, as well as for my clinical assistant, Dr. Biro, the right of possessing the abilities of an average orthodontist.

The description of the following three cases may at the same time serve as a practical illustration of the theoretical discussion in my previous report; they prove that certain incidents which I have never observed before during the fre-

quent treatment of quite similar cases when using intermittent force (and which incidentally so far have never been reported in literature as failures with disastrous results) cannot be blamed entirely on the operator. Furthermore I do not feel personally responsible for the genuine root resorptions on the four maxillary incisors, which I shall describe in the third case; but I consider the appliance as solely to blame, contrary to those root resorptions already shown elsewhere[18] which were due to my treatment.

I report these cases in order to describe two failures of a similar nature which during many years of using intermittent force I had never observed, and which I noticed for the first time when using continuously acting force.

"The fundamental fault in the classic Angle expansion arch is the use of ligatures, for from these only a tilting movement can result." (Salamon.[41]) This is considered the greatest objection to the use of the Angle arch, but do lingual springs move the teeth primarily other than by tipping, and is not this tipping much more intense than with intermittent force? As shown in the earlier part of this report (page 251), a continuously acting force of as little as 3.5 gm. produces a deviation of the apex in a direction opposite to the movement of the crown. It thus gives rise to a pathologic condition.

Is not the reaction of the functional forces against the tilting the same in any case, whether it be caused by ligature (pull) or by spring (pressure)? In fact, the Angle arch is more favorable, because by the use of slight intermittent force there is no deviation of the apex; therefore, the conditions for the functional straightening, for the forward movement of the apex, are much improved. (All these questions have been discussed in the first chapter of my treatise.)

Case 1.—Patient, ten years old. On both sides the space for the $\underline{3\,|\,3}$ entirely closed by a symmetric forward movement of all posterior teeth, and by shifting to the right and lingual of the right maxillary incisors causing the formation of the diastema (Figs. 2 and 7). As a result of a premature loss of the $\underline{|\,V}$, the first permanent molar shifted more forward on this side than on the right; hence on the left side the symptoms of a full Class II occlusion between $\frac{|\,6}{|\,6}$ (Fig. 3); on the right, only end-to-end bite (Fig. 1). The mandibular anterior teeth have drifted distally, thus reducing the space for $\overline{5\,|}$ which is impacted under $\overline{6\,|}$ (Fig. 9). The median line was displaced by half a tooth's width to the right (Fig. 2). Both mandibular molars were on the same vertical level, not moved forward.

Diagnosis: Class I; Case of mutilation, wandering of teeth as described above. The maxillary right anterior teeth have adjusted themselves to the distal movement of the right anterior teeth and have contact with the receded mandibular teeth, thereby giving the appearance of a deep overbite.

In conformity with this analysis the treatment must be performed in the following order: (1) symmetrical distal movement of all maxillary posterior teeth; (2) establishing symmetry of the median line and proper occlusion in the mandible by bringing the right mandibular anterior teeth forward by half the width of a premolar; (3) to the same extent, however, the $\underline{2\ 1\,|}$ must first be moved forward and to the left, in order to close the diastema.

All this, as will be seen when comparing Figs. 1, 2, and 3 with Figs. 4, 5, and 6 (compound impressions), was successfully performed by establishing normal mesio-distal relations of the posterior teeth. The symmetrical distal

Fig. 1. Fig. 2. Fig. 3. Fig. 7.

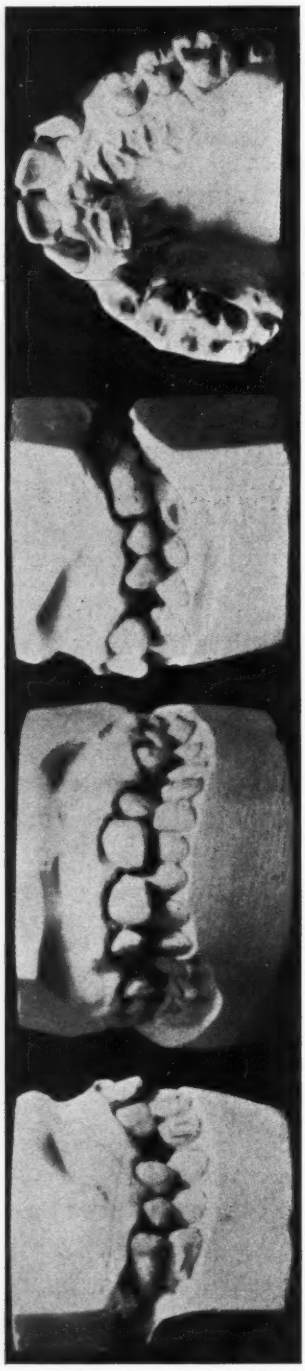

Fig. 6. Fig. 4. Fig. 5. Fig. 8.

movement of the maxillary posterior teeth can be studied in the occlusal views of the pictures (Figs. 7 and 8) : the space for alignment of the $\underline{3 \mid 3}$ has not yet been completely obtained. The correction of the deep overbite and the achieve-

ment of symmetry of the median line (slightly overcorrected) may be seen by comparing Fig. 2 with Fig. 4. The 2 1 | would have to be moved more to the left in order to close the diastema completely.

The distal movement of the maxillary posterior teeth was commenced with headgear and traction bar and for the time being the relatively slight forward movement of the maxillary anterior teeth was discontinued. As soon as the distal movement of 6 | 6 was already fairly advanced, the pin and tube appliance was applied to the anterior teeth; the movement of these teeth progressed very slowly, in fact they made no progress. Therefore, in September, 1932, the lingual arch was applied for the distal movement of 5 4 | 4 5, as well as for the intended movement of the anterior teeth. In the typical manner, as shown by Korkhaus, finger springs were brought into action to open the space

Fig. 9.

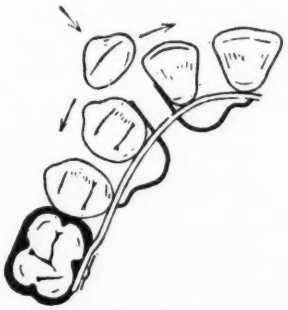

Fig. 10.

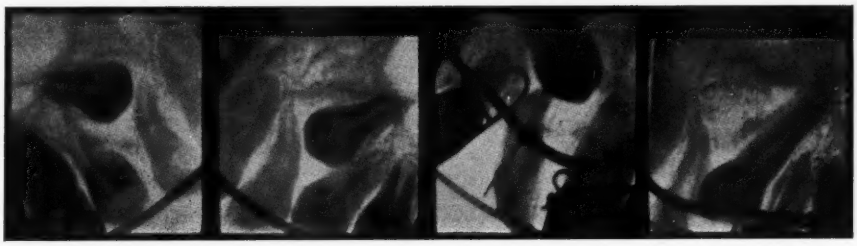

Fig. 11. Fig. 12. Fig. 13. Fig. 14.

necessary for 3 | 3 (Fig. 10: Korkhaus, Fig. 219); at the same time two springs were applied for the frontal movement of 2 1 | 1 2. Korkhaus says of this movement, "The combined action of a mesial and distal spring provides an excellent way to open up a space closed after extraction. . . ."

The radiograms of the 3 | 3 at the beginning of the treatment (Figs. 11 and 12) showed a favorable position for the spontaneous eruption of these teeth (after obtaining the necessary space), which position was unchanged when the lingual arch was applied. The distal movement of the premolars, by means of the springs, proceeded rather quickly; 1 | 1 2 also went forward, but 2 | was noticeably tipped, and twice after the spring had broken immediately returned to its old position. The 0.4 strong spring was made active to 1 mm. on October 4, October 31, December 7, 1932, and on Jan. 25, 1933 (on October 31 and December 7, 1932, new springs had to be soldered on because the old ones were broken). On February 24, 1933, the date fixed for the next visit, a distinct in-

clination of 2 | was noticeable. A radiogram taken on this date gave the explanation for this (Fig. 13) : the root of 2 | had deviated *distally* to the crown of the impacted canine which had erupted slightly downward into the enlarged space between the roots of 2 | and 1 |. The root of 4 | had inclined mesially and, with the root of 2 | inclined distally, had reduced the space required for 3 | to approximate 2.5 mm. Thus the canine could never spontaneously regain its correct position between 2 | and 4 |. At best the canine could erupt in place of 2 |, after complete distal movement of the latter.

No such inclination took place on the left side, because before the beginning of the movement | 3 had worked its way down a little deeper between | 2 and | 4 (Fig. 12). The root of | 2 had also inclined distally but at first found an obstacle in the | 3 crown, a contact which finally caused a slight resorption on the distal side of the apex, that is, in the area of the contact (Fig. 12). With increasing space between | 2 and | 4, the canine had worked its way deeper.

The wrong position of 3 | left no other way than to extract 4 |. At the same time 3 | was exposed by an operation and a small hook cemented to free it from its wedged position between 2 | and 1 |. For the sake of symmetry | 4 also had to be sacrificed.

Any further comment is unnecessary.*

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(To be continued)

*This case alone would be sufficient to prove that the formula of Schwarz—"20 gr. pressure per sq. cm. guarantee the best biologic result"—is wrong.

CHROME ALLOY*

ARCHIE BRUSSE, D.D.S., AND J. LYNDON CARMAN, D.D.S., DENVER, COLO.

CONSIDERABLE interest has been shown recently in chrome alloys as a substitute for noble metals in orthodontia therapeutics. However, there has been very little published, as yet, in orthodontia literature in reference to this heroic substitute. Those of us who have pioneered in using chrome alloys have been compelled to secure information from commercial sources and to apply it, as best we might, to our own field; therefore, the progress in the use of these alloys in our specialty has been very slow.

This article presents a rather minute account of our findings during more than two years of actual practice with this new material, together with our conclusions as to the technic necessary for its use.

Chromium is a grayish white metal derived from the mineral chromite, or chrome iron ore ($FeCr_2O_4$). Although it was discovered by Vauquelin in 1797 and in the form of chrome steel had been known to the scientific world for years, it was not brought to the attention of the general public until 1913 when an Englishman by the name of Brearly invented what is called "stainless steel"—steel made by adding ferro chrome to molten mild steel. The word "stainless" is not fully descriptive of this metal. It is unaffected by rust, stain, tarnish, corrosion, and all acids except concentrated HCl. It is from one to four times stronger than mild steel; it can be fabricated easily in strips, tubes, wires, or any other form; and it may be secured in hard, soft, or dead soft grades. It is called the metal of endless possibilities.

There are two series of chrome alloys: (A) chromium alloy steel (magnetic), and (B) chromium nickel steel (nonmagnetic). In each of these two groups there are a number of types differing in chemical composition, not all of which are adaptable to our use. All reference in this article pertains only to U. S. S. Stabilized 18/8, which is a member of Group B. Nonstabilized 18/8 is the most common of all chromium steels and has the widest range of application. This alloy, which contains 18 per cent chromium and 8 per cent nickel with less than 0.15 per cent carbon, possesses ample corrosion resistance and extraordinary toughness. Being an austenite, it is nonmagnetic and cannot be hardened by heat treatment. The solution of carbon in austenite is unstable, and the carbides tend to precipitate on long exposures to moderate heats. This critical temperature is between 1,200° F. and 1,400° F. The precipitating carbides are largely found in grain boundaries, where they cause embrittlement and increase corrosive attack. This fault is easily corrected by the addition to chrome alloy of certain elements, titanium or columbium, which prevent or retard the migration of carbides to the grain boundaries. This process is called stabilization.

*Clinic presented at the Thirty-Second Annual Meeting of the American Society of Orthodontists, Oklahoma City, November, 1933.

Fig. 1 shows a piece of stabilized 18/8 welded to a piece of nonstabilized 18/8. There is no change in the stabilized piece (*A*). In soldering operations the time that the metal is exposed to heat is usually short; nevertheless, alloys containing more than 0.07 per cent carbon always manifest some carbide precipitation. To maintain temper of arch wires it is necessary to work solder at a temperature below the annealing point of 18/8, and as this temperature is within the critical range of carbide precipitation, we deem it advisable to use stabilized chrome alloy in all appliance construction.

In our experience we have noticed no form of corrosion in the stabilized material, but corrosion has occurred in a few areas in the unstabilized form which we attributed to carbide precipitation. It is important to have chrome appliances highly polished because this adds to the corrosive resistance and prevents foodstuffs from adhering to appliances. Chrome so treated will retain its luster throughout its entire length of service. Because of the elasticity and toughness, breakage of arch wires is extremely rare.

The management of 18/8 in appliance construction is entirely different from that of gold and platinum. It cannot be hardened appreciably by heat

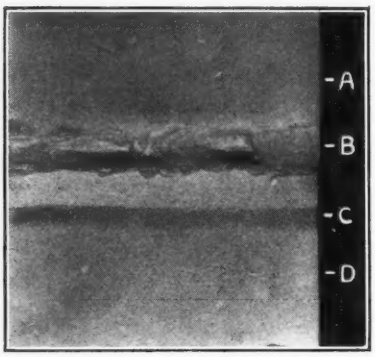

Fig. 1.—Section of welded steel: *A*, stabilized 18/8; *B*, welded joint; *C* shows the precipitation of carbides in the nonstabilized steels; *D*, nonstabilized 18/8.

treatment, and in certain soldering operations it is more difficult to secure solder unions with it. It has been, therefore, toward the solution of these two problems that we have directed our efforts, and even this brief period of experience has demonstrated that temper can be controlled, and that the use of solder in certain operations is successfully accomplished by the use of the proper technic.

GENERAL TECHNIC

1. *Solder Problems Involved.*—It is essential that the solder for chrome use be extremely tough, have a low fusing point, and yet have the resistance necessary for withstanding the action of the fluids in the mouth. Most solders have a high copper content in order to lower the fusing point. In our search for an easy flowing solder, we secured one which we later discovered contained 48 per cent copper. This solder broke down in a very short time, and we attributed the disintegration to galvanic action.

It is generally known that when a small galvanic voltage is generated by the current set up by two unlike metals, which are wet with a liquid that will carry an electric current, the current tends to attack one of the metals and

to protect the other. It is for this reason that soldered units that will stand up indefinitely in the laboratory and that cannot be separated mechanically will in from four to six weeks' time break down in the mouth.

In order to test the resistance of various solders it was necessary to devise a way of hastening the galvanic action. As the salt spray test is commonly used for testing stainless steel, we devised a testing unit that would spray the soldered parts continually with salt solution.

For the first test, we used eight bands with tubes attached by different types of solder and eight pieces of 0.036 wire with soldered 0.018 auxiliary springs under tension. This experimental material was attached to a wheel constructed by spot welding pieces of 18/8. The force of the air from the salt spray caused the wheel to revolve. The spot welded joints were not affected after spraying for 1,200 hours, although the solder with 48 per cent copper broke down in twenty-four hours; other solders broke down in different lengths of time. Two solder joints survived but were easily broken away by twisting with pliers.

After completing the test, we set about obtaining a solder low enough in fusing point for use with chrome alloy, which at the same time would not endanger its properties. It was necessary also that the solder be stronger, since in the soldering of chrome all that can be obtained is a close adaptation of two metals—no false alloying at the joints, such as takes place with gold, being obtained. It was imperative also that the solder cause no galvanic corrosion when it came in contact with the fluids of the mouth. Since copper is the metal in the solder most active in causing galvanic action and, at the same time, is the one used for lowering the fusing point, the difficulty encountered may be readily seen. The solution of the problem proved to be a 500 fine gold solder with less than 1 per cent copper in its make-up and a fusing point low enough to make it adaptable to the needs of chrome technic. This solder has proved to be very satisfactory.

2. *Flux.*—The best flux we have found for use with chrome alloy is one which has potassium floride as a base. This can be used with boric acid or borax. The formula we are using today is as follows:

Hydrochloric acid	2 minims
Potassium floride (Baker's)	300 grains
Boric acid	200 grains
Borax	50 grains
Silica (150 mesh)	50 grains
Sodium carbonate	50 grains

These may be titrated into a creamy mass. If the mixture becomes dry, add one or two drops of water and stir until it regains its original creamy consistence. In soldering, use enough flux to form a glass bead that will protect the chrome alloy and prevent the formation of a scale. If the material becomes black, clean the metal and make a fresh start. Sodium carbonate combines with silica to form nascent sodium silicate which holds the bead during the process of chemical action and will protect the area to be soldered through temperatures of red (1,470° F.).

3. *Flame.*—Chrome alloy 18/8 is not responsive to heat treatment and, therefore, can be tempered only by cold working. The annealing point of this alloy is approximately 1,600° F., and in our technic we must keep the temperature below this point. The solder technic given above can be applied below this temperature (1,600° F.). When pyrometers, which are expensive, are not available for the determining of such temperature ranges, it becomes necessary for the practitioner to become familiar with the color ranges. The following chart shows these color ranges:

1. Fair red	960° F.	
2. Dull red	1,290° F.	Range to use in soldering
3. Brilliant red	1,470° F.	
4. Cherry red	1,650° F.	
5. Bright cherry red	1,830° F.	

The flame used must be one that will not overheat the work, especially the small auxiliary springs. A flame of approximately one-half inch in height coming to a blunt point with a blue aurora tip in the flame is most desirable.

SPECIAL TECHNIC

In all-chrome technic, it is advisable to avoid having soldered areas at points of stress and shock. To explain fully the protection of these areas, it is necessary to describe in detail band construction and arch technic.

We use seamless bands made of stabilized chrome alloy. These bands are beveled at the occlusal one-fourth by spinning over steel dies. The dies are anatomical reproductions of molar teeth that have their cusps ground away to the level of the crest of the mesial and distal marginal ridges; therefore, the beveled fourth of the band resembles that portion of the tooth above the bell. This natural shape limits the depth that the band can be forced toward the gingival. Excessive force will cause the band to take up the gingival slack at the mesial and distal and cause the band to fit more tightly. The only alteration necessary on the occlusal portion of the band is the placing of the lingual grooves on the upper, and the buccal grooves on the lower. Grinding and cutting is necessary only at the gingival portion to establish depth of the band. Care must be used not to have the band extend too far under the gingival tissue, as it will be difficult to remove after cementation.

Procedure for Fitting Maxillary Molar Bands.—Bands are made in twelve different sizes. Select a band of proper size, one that will fit snugly over the bell of the tooth. Bend the band between thumb and forefinger until it assumes the rhomboid shape of either the right or the left molar. Place the band on the tooth with the grooved surface to the buccal. Have the patient bite on a wooden tongue blade. The band can then be forced deeper by band adapters. Remove the band and trim around the gingival.

After securing the proper length of band, crimp the band around the gingival to assure close adaptation at the neck of the tooth. When this has been done, the band can be forced over the tooth, where it will snap into place.

(This cold working will add spring and hardness to the metal. Chrome alloy 18/8 will increase in hardness and elasticity from five to eight times by cold working.)

The occlusal bevel of the band determines its length. Do not destroy this contour by grinding. The final and most important operation is seating the band. This is accomplished by use of the Eby band driver. This instrument must be used vigorously on the lingual portion of the maxillary band only, and the band must be driven to its limit to escape occlusion of the mandibular cusps. The band adapter is then used to form a lingual groove.

Procedure for Fitting Mandibular Molar Bands.—These bands are made in twelve different sizes also, but differ considerably in form from maxillary molar bands. They are cut at a twelve-degree bias. The buccal surface is lower

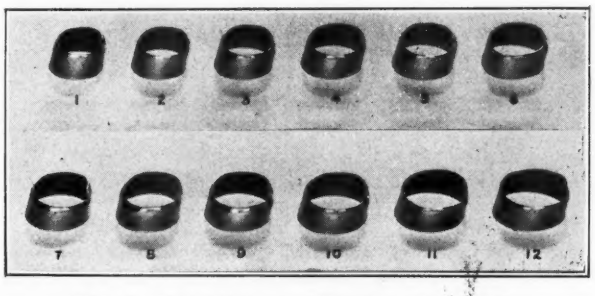

Fig. 2.—Seamless maxillary molar bands.

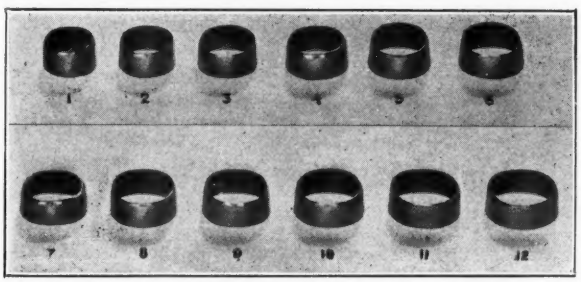

Fig. 3.—Seamless mandibular molar bands.

than the lingual. The lingual surface inclines inward toward the gingival. Mandibular bands are adapted in much the same manner as the maxillary bands. The surface containing the groove is placed to the lingual.

Follow the technic for maxillary band fitting to the final seating of the band. From this point on, the only force necessary is the driving of the band into position by use of the Eby band driver. This driver must be used on the buccal surface only on the mandibular band. Place buccal grooves with the band adapter. The band on the buccal surface must escape occlusion of the maxillary teeth.

The weakness of the seamless molar band technic results from two causes: the use of band forms that do not fit the anatomy of the teeth, and the lack of sufficient size range.

The bands we use are designed from typical tooth forms secured from study of extracted teeth. Considerable thought has been given to the study

of the mandibular series, and the design produced enables us to fit mandibular molars more successfully than formerly, using other bands. While twelve graduated sizes are insufficient to cover the various sizes of teeth encountered, with the aid of band stretching pliers of the expansion bolt type with tips carved in the same shape as the bands, any number of intermediate sizes can be formed without destroying the shape of the band. This band stretcher expands laterally in four directions and is capable of enlarging a band two sizes. This not only gives us an unlimited size range, but proves invaluable when certain numbers are out of stock.

The stiffness and springiness of 18/8 alloy makes this metal ideal for band material. In lingual arch construction, if solvite impressions are taken

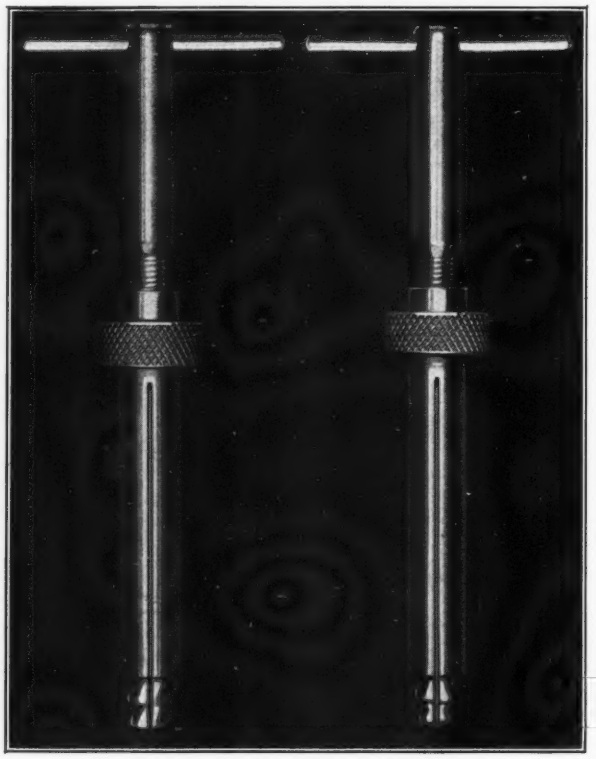

Fig. 4.—Band stretcher.

and stone models made, the bands can be removed from casts and cemented with the same accuracy as overlays, and the lingual arch may be placed in the mouth without alterations. We have never experienced this pleasure with gold platinum bands.

When making attachments of buccal and lingual tubes to bands, we cannot depend upon solder alone for strength. The mechanical strength of this joint should be obtained by spot welding. The process of uniting lingual tubes to bands is a simple one, as stabilized 18/8 is ideal for spot welding. This process is more accurate in placing the tube and takes less time than soldering. High heats are necessary for welding two pieces of metal together, and in spot welding this heat is generated by the resistance to the electric current. It is necessary to have pressure to complete the weld, and the

electrodes are in contact under spring tension. It is important that the electrodes be of proper size and shape for each different spot welding operation. In spot welding Ellis type tubes to bands the upper electrode has the shape of a gold plugger point. The foot of the plugger is in contact with the lower inside wall of the lingual tube. The lower electrode is much larger so that it will contact the upper fourth of the inside of the band. This difference in design of the upper and lower electrodes is necessary because we are welding two metals of different thicknesses. The upper electrode is pointed to concentrate the current and hasten the welding temperature of the thicker material of the tube. The lower electrode contacts greater area of band surface and retards welding temperature of the thinner material (the bands);

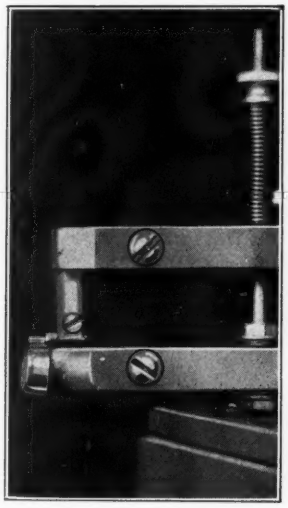

Fig. 5.—Spot welder.

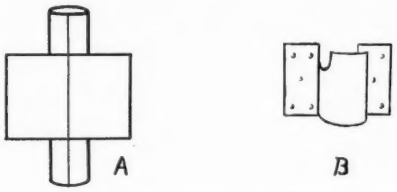

Fig. 6.—*A*, Buccal flange tube. *B*, Lingual flange tube.

therefore, the two pieces of metal of different thicknesses will reach welding temperature at about the same time. A fraction of a second's exposure will complete the welding, the time depending upon the weight of the current.

Lingual tubes used in this technic are $\frac{9}{64}$ long with walls of 0.014 diameter to accommodate two 0.036 wires, and are spot welded to the band in two places; one toward the occlusal and the other toward the gingival. These tubes are grooved at the occlusal to accommodate the Ellis type arch.

Dr. Sheldon Friel, of Dublin, has devised a rectangular lingual tube stamped from flat material. This tube has three walls, and the ends of the material extending from the side walls are spot welded to the molar bands. The lingual portion of the molar band supplies the inner surface of the tube.

We find that by increasing the length of the tube 0.036 of an inch and

placing the groove at the occlusal portion to accommodate a 0.036 in. wire, more stability can be secured when using the Ellis type arch. This tube can be securely attached to a molar band. The standard half round tube has two 0.0125 walls and accommodates a 0.025 post with a total thickness of tube of 0.050. Because of the absence of one wall and using 0.014 stock and 0.036 lingual arch, this new rectangular tube has the same total thickness. The extra 0.036 of an inch in length covers the lingual arch so that there is no actual length to the tube as in Fig. 6, *B*.

Buccal tubes cannot be satisfactorily welded to bands by passing the current directly through tube and band. Too much pressure will collapse the tube, and if the exposure is too long the tube will be burned, and the metal will be deposited inside which it will be necessary to clean out with reamers.

A more secure method of attaching buccal tubes is by use of the flange buccal tube. This is a one-piece tube having a projection of material from the underside extending toward the gingival and toward the occlusal. These wings or projections give sufficient area for spot welding these surfaces to the band without changing the form of the tube. It is a decided advantage to

Fig. 7.—Incisor band.

spot weld buccal tubes on bands. The tube can be tacked on by a single weld and the band returned to the mouth where it is then aligned to the proper angle. The band is then removed and welded to the new position.

Incisor bands can be quickly and accurately constructed by spot welding. Form a piece of ribbon chrome alloy 0.003 in thickness around the incisor, pinch a seam on the lingual surface with a pair of band forming pliers. The two ends of excess material are spot welded together at three points as close to the band as possible. The united ends are cut away about 1 mm. from the band. The band is then returned to the tooth, and the 1 mm. end forming the seam is folded and burnished to the lingual surface. This overlap of material burnished to the lingual surface is then spot welded to the band in three places. (Fig. 7.) A satisfactory attachment can be welded to the labial surface of incisor bands for labial arches. Bend double a piece of 0.018 wire. By using a pair of No. 139 pliers the doubled end can be bent to fit partially around the size of arch used. The two loose ends are bent away from each other at an angle of 90 degrees and welded to the bands. Two welds should be made on each loose end. Care should be taken not to have the weld close to the first bend. Arch wires will snap into place and it is not necessary to tie.

The Ellis Arch.—Dr. Ellis has devised a type of lingual arch which we have found best suited to the chrome technic. The reason for our preference

is that this arch is so constructed that the soldering of half round shafting to the arch is eliminated. Previously, in the lingual arch technic that has been the standard used by the majority of practitioners, a great amount of breakage occurred anterior to the section where the shafting is attached to the lingual arch. With our change to the Ellis type arch we eliminated in our practice this vital point of breakage. Furthermore, the Ellis type arch is one of the simplest in construction of the arches presented to us to date.

Construction of the Ellis Arch.—A piece of 0.036 in. wire is annealed approximately two inches from the end of the wire (Fig. 8, *A*). The wire bending pliers are used to squeeze the wire all the way together (Fig. 8, *B*). Grasp the bent section (section bent with pliers) approximately one-tenth of an inch

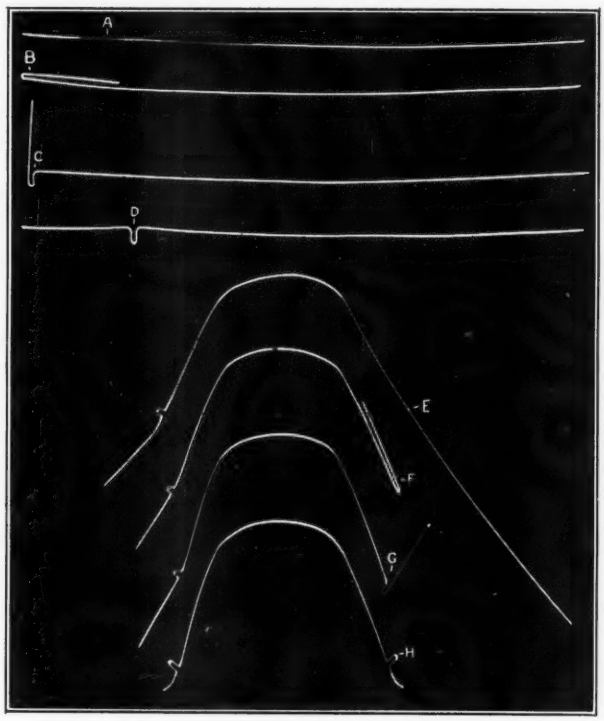

Fig. 8.—Ellis arch technic.

from the end, and force the long end of the wire to right angles (Fig. 8, *C*). Holding the wires firmly with pliers, bend the short end to a straight angle (Fig. 8, *D*). Place on the left side of the model the arch in the Ellis type tube, and adapt the arch to the model with pliers and fingers approximately to the position desired. Holding the arch in position on the model, make a mark or scratch anterior to the tube on the right side (Fig. 8, *E*). Anneal posterior to this scratch a section of wire, allowing the annealing point to come within about one-tenth of an inch of the scratch. Holding the pliers posterior to this scratch make a bend of the wire upward, then backward upon itself (Fig. 8, *F*); then bend the arch, rather than the length of wire, downward in the same manner as in *C* (Fig. 8, *G*). Taking the end of the wire, bend it to a straight angle (Fig. 8, *H*).

Place the arch in the tubes. Then, with an electric arch adapter, like that shown in Fig. 9, hold in place, and with intermittent pressure on the spring foot switch, adapt the arch to a passive stage on the model. Keep in mind that the arch must not be allowed to become hotter than a dull red (1,290° F.). It is for the purpose of being able to see through the medium of our color range the amount of heat we are applying to the arch that the electric arch adapter is used. When a flame is used for adapting the arch, there is danger that annealing may not be uniform and that soft areas in the arch may result.

We use the simple wire lock made of 0.020 wire soldered to the posterior end of the arch. The lock is bent and attached as in Fig. 10, *D*.

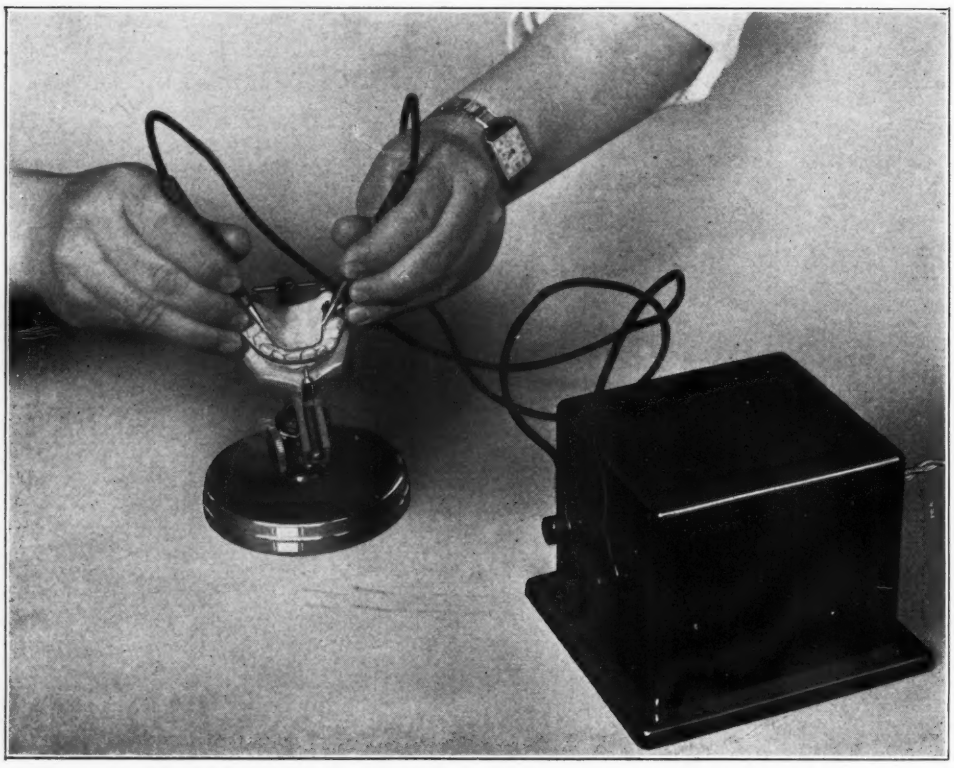

Fig. 9.—Electric arch adapter.

Procedure for Attaching Auxiliary Springs.—It was not considered unusual to have gold platinum auxiliary springs break, and so we should not be too critical where we have an occasional chrome alloy spring become unsoldered.

In soldering chrome alloy, it is important to get as much surface contact between the spring and the arch wire as possible; for this reason the method of attaching the auxiliary springs differs from that used with other alloys. The types of attachments that have been used very satisfactorily by us are the half wrap, oblique wrap, and the coil wrap. The half wrap is attached in the following manner:

With a No. 139 S. S. White plier, make a small bend at the end of the wire and attach to the arch wire as in Fig. 10 *A*. From this point bend the

auxiliary springs in your accustomed manner. The oblique wrap is attached as in Fig. 10 *B*. The coil wrap is the one with which most of us are familiar, and the one in most general use (Fig. 10 *C*).

Only a small amount of solder is needed, but we apply the solder both to the base wire and to the auxiliary spring. When soldering the extremely small auxiliary springs (0.018 and 0.016), one is likely to soften the spring at the point where it is soldered. The temper can be regained wholly or partially by twisting the wire. Or, if a coil wrap spring is used, the process of making the spring will often temper it again. Much smaller gauges of wire may be used when chrome alloy is used for making auxiliary springs than when they are made of gold platinum. We are now using 0.018 and 0.016 auxiliary springs in chrome alloy where, formerly, we used 0.022 and 0.020 auxiliary springs in the precious metals.

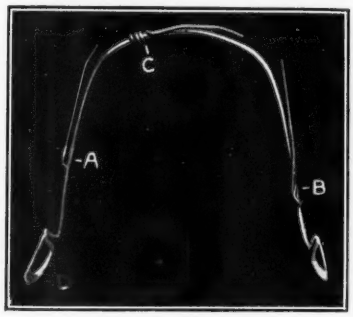

Fig. 10.—Attachment of auxiliary springs.

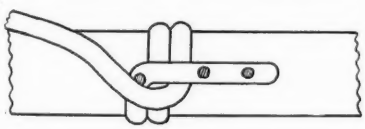

Fig. 11.

It is a simple operation to spot weld together two flat pieces of 18/8, but it requires some experience and skill to spot weld small auxiliary springs to labial and lingual arches. If we use an expensive automatic timer, our spot welds could be controlled; but the personal element enters into the operation when using a hand switch. With experience we became more expert and our results improved. Use electrodes tapered to about one-eighth inch. These electrodes are grooved at the ends, one for the larger base wire and one for the smaller auxiliary spring wire. The groove prevents flattening of wires. If there is too much heat and the exposure is long, the base wire will be annealed at the weld causing a soft spot in the arch. Place base wire between electrodes with the underside facing upward, the free end toward the operator. Anneal a piece of the auxiliary spring wire. Only a small area at the end of the wire is annealed to allow for convenience of wrapping. This annealed end is placed between electrodes above the base wire extending one-eighth inch beyond the base wire at right angles. Use light pressure and short exposure to tack wire to arch. Wrap spring around arch with two wraps. The one-eighth inch extension is folded over the two wraps and welded to the arch wire as in Fig. 11.

The auxiliary spring is completed in the usual way. Form wrap so that pressure will work in the direction of the wrap causing wrap to tighten. The strength of the attachment is in the half hitch or wrap and not in the weld, and if pressure is against the wrap it will uncoil slightly and disturb the weld.

We are indebted to Dr. Sheldon Friel for this type of auxiliary spring attachment.

Polishing.—Stainless steel is at its best when highly polished. It is more resistant to corrosion, food will not adhere to it, and it is much easier to clean. Iron oxide polishing compounds and dry abrasive powders should not be used, but rather the polishing compounds with a grease base on a felt grease wheel, such as Sure Shine. Finish with gold rouge.

Pickling.—Scale can be loosened by employing a hot solution of sulphuric acid 10 per cent and rock salt 10 per cent, at approximately 180° F.

We advise against too rapid replacement of chrome for gold platinum appliances until one masters the chrome alloy technic, which is entirely different from the technic used for precious metals.

We use U. S. S. Stabilized 18/8 because it resists corrosion and intergranular attack under the most unfavorable condition, because of its extreme hardness which prevents marring of appliances, because of its elastic limit and tensile strength, and because of its elasticity and springiness.

ANTEROCLUSION AND APPARENT ANTEROCLUSION*

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IN PRESENTING these two short case reports I have nothing new or startling to offer. They will probably be a repetition of many cases presented before this Society in former years, but one is of interest from the standpoint of the age of the patient, and the other from the fact that it may be mistaken for a case of anteroclusion, or Class III Angle Classification.

CASE 1.—Figs. 1 and 2 show the anterior, two lateral and occlusal views of a medical student, twenty-one years of age. The case was further complicated

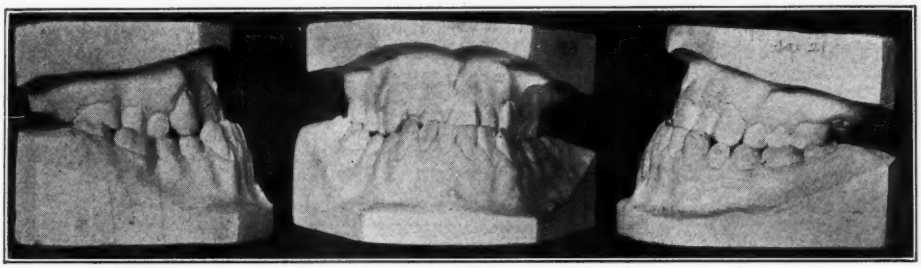


Fig. 1.

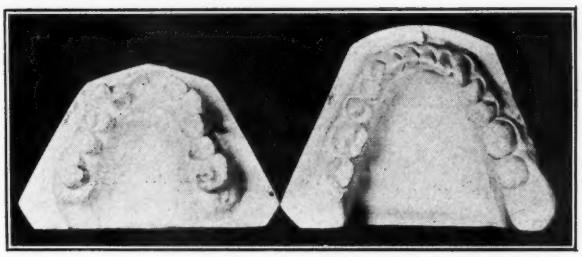


Fig. 2.

by the loss of the maxillary first permanent molars, the malformation of the second permanent molars, the narrowness of the maxillary arch, and the fact that the maxillary right lateral incisor was crowded lingual to the canine and central incisor.

In June, 1929, a pin and tube appliance and lingual arch were placed on the maxillary arch to start the widening and rounding out required to accommodate the retraction of the mandibular arch. In November the lingual arch was removed, and in December an edgewise arch was placed on the mandibular teeth to establish the normal curve of Spee.

The use of intermaxillary elastics was started in September, 1930. They extended from the distal portion of the maxillary appliance to the canine region of the mandibular appliance.

*Presented at the Thirty-Second Annual Meeting of the American Society of Orthodontists, Oklahoma City, Okla., Nov. 8-10, 1933.

In June, 1931, an edgewise arch was placed on the maxillary arch for further rounding out of the arch and greater stabilization, and in November a Hawley retainer was used.

The Hawley retainer seemed to cause a rotation of the first premolars; so in March, 1932, lingual appliances were placed on both maxillary and mandibular arches to rotate the maxillary first premolars, and the mandibular left canine. On the buccal side of these bands were used the bite planes, as suggested by Dr. George Grieve, to overcome the tendency of the mandibular arch to protrude, but reversed in inclination.

In April, 1933, Hawley retainers were constructed for both maxillary and mandibular arches, the same idea being used, except that the planes extended lingually from the retainers.

At present the patient is wearing no appliances whatever. The muscles of mastication and function of the jaws have developed to such an extent that

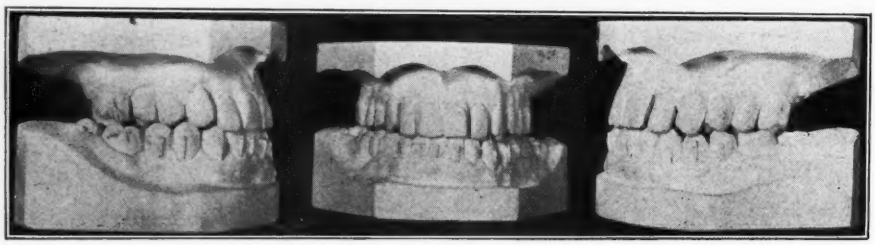


Fig. 3.

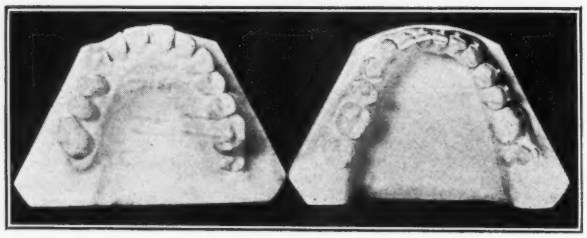


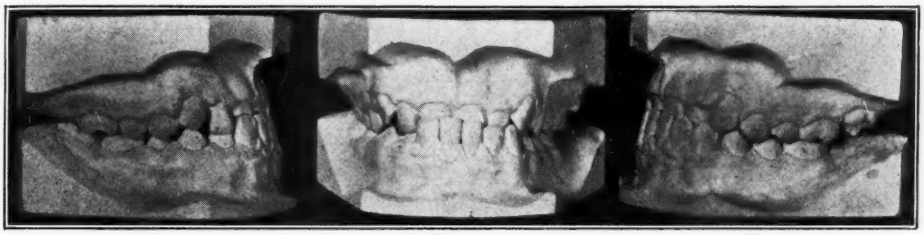
Fig. 4.

I believe there will be no relapse. However, the patient is being kept under observation.

Figs. 3 and 4 show the case at about the time the lingual appliances and buccal bite planes were placed in the mouth.

Case 2.—Upon glancing at Fig. 5, *B*, a good deal the same condition seems to exist. Fig. 5, *A* and *C*, however, show that the molar relation is much better. This girl was eleven and one-half years old when treatment was started, and Fig. 6 shows the retrusion of the maxillary incisors and the crowding of the canines. A maxillary lingual appliance was used with the canines banded to rotate them and hold a light spring against the incisors. This was placed in November, 1929; in December a lingual appliance with extensions to the second molars was placed on the mandibular arch to widen it.

In October, 1930, extensions from the buccal surface of the maxillary first molars were used to force the second molars lingually.



A. *B.* *C.*

Fig. 5.

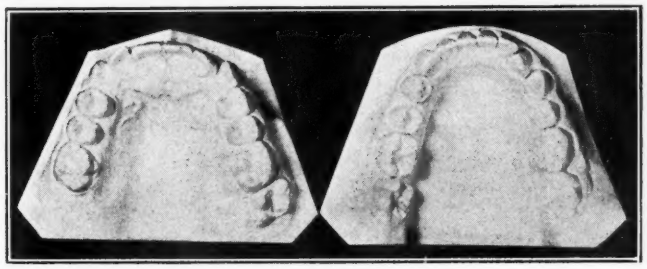


Fig. 6.

The same general treatment was carried on until June, 1933, when a Hawley retainer was placed on the mandibular arch with the results shown in Figs. 7 and 8.

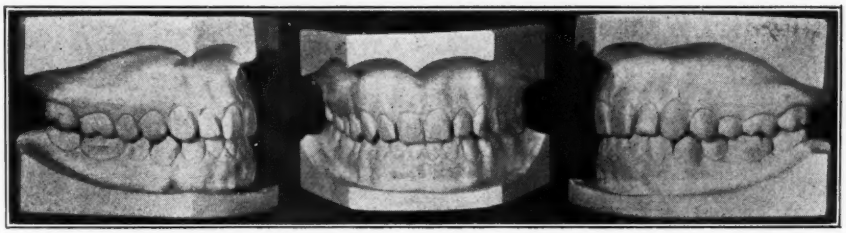


Fig. 7.

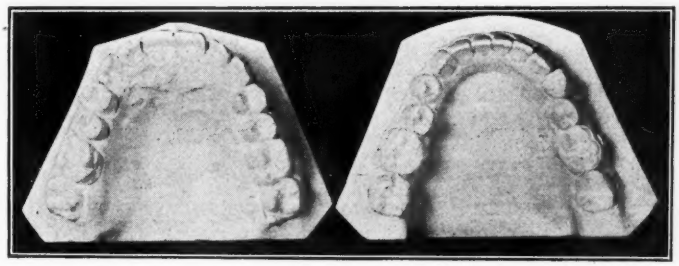


Fig. 8.

The patient is now fifteen years old, and periodic radiographic examinations are being made of the developing third molars, and the case is kept under observation.

A SAFE AND SIMPLE METHOD OF OPERATING ON AND ELEVATING IMPACTED CANINES*

KIRMAN E. TAYLOR, DENVER, COLO.

I SHALL not go into detail about the consequences of extraction. We need only visualize that the canine helps form the angle of the mouth and we know what the effect will be on the contacts and that every plane of the dental apparatus will be out of balance, all of which is so essential in efficient mastication.

The purpose of this clinic is to explain and demonstrate the method that I have many times used with success. It has never been necessary to make cavities or mar the enamel of an impacted tooth.

I shall endeavor to give a brief outline of the steps and method, using x-ray pictures and photographic illustrations of models.

CASE REPORT

The impacted canines were found in the mouth of a patient seventeen years of age. The arches are well shaped, teeth well formed and in good occlusion. The deciduous canines have not been exfoliated; absorption has made but little progress, but the crowns of the teeth are worn and cupped.

Accurate models of the case and complete x-ray examination that will show the exact location of the impactions are very necessary.

Three pictures should be taken of each impaction when there is doubt as to the location. The lingually impacted canine seems to follow the direction of the focus of the x-ray tube, and the labial impaction apparently travels in the direction opposite to that of the focus of the x-ray tube.[1]

Occlusal or horizontal x-ray pictures are being used by some, and they certainly give valuable information. I shall not go into detail about locating and finding impacted teeth.[2]

OPERATION

The field over the impacted canines must be well anesthetized; local infiltration will suffice.

A sharp straight lance is used to cut a round hole through the tissue to the process that covers the tooth. This island of palatal flesh is completely removed with a pair of rongeur bone or root forceps leaving a good-sized round wound or hole in the palate. The process covering the tooth can be removed with a straight chisel, uncovering the tooth. There will naturally be some initial hemorrhage which will soon subside, leaving secondary serum exudate. This is con-

*Clinic presented at the Thirty-Second Annual Meeting of the American Society of Orthodontists, Oklahoma City, Okla., November 8-10, 1933.

trolled by searing the edges and side of the incision with an iodab stick. These iodabs are small, round sticks similar to a kitchen match with a knob of pure iodine moulded on one end. There will be enough serum in the cavity to moisten and cause the free iodine to flow and blacken the walls and stop the exudate.

CEMENTATION

A small brass wire is twisted so that the base will partially fit the uncovered portion of the canine with an eyelet extending down which will permit tying

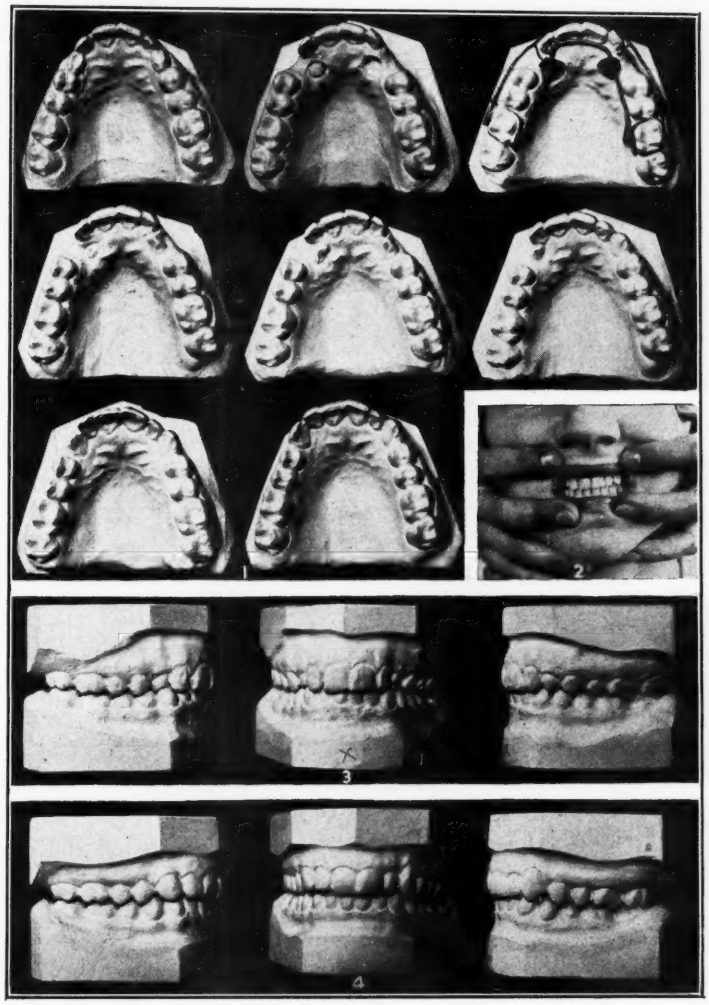


Fig. 1.—Progress during treatment.
Fig. 2.—Finished case.
Fig. 3.—Models showing case before treatment.
Fig. 4.—Models showing case after treatment.

with a ligature. I do not use, or advise, alcohol, because it lays down a precipitate which seems to prevent the cement from adhering to the tooth, but the field can be well dried with compressed air.

Ames black copper cement is used and must be mixed fast and of the right consistency to be handled. It is a good policy to make several test mixes.

Some cement is put on the exposed canine; then the eyelet, which has been

adjusted, is incorporated in cement on the slab with No. 110 pliers and is settled into the mass on the tooth. This cement mix sets fast and should be kept dry. Use plenty of cement. Place a small piece of iodoform gauze over the opening

Fig. 5.—X-ray films of case illustrating each successive step.

and use a spring from either the lingual or labial appliance to hold the gauze in place. Do not tie for a week or so until the wound is well healed. Then tie the ligature through the eyelet to a spring, being careful to use the gentlest pressure possible.

After the tooth has come down some, and if the progress is not in the right direction, the original cement can be removed and new cement put on with the eyelet in the proper direction.

Eventually the tooth will erupt enough to put a band on the tip, or perhaps a spring from the lingual wire will suffice. The final adjustments can be made by appliances most adapted to the individual case.

The illustrations show each consecutive step.

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THE AUXILIARY LOOP AS A NECESSARY ADJUNCT IN THE LINGUAL WIRE TECHNIC*

WILLIAM J. SPEERS, D.M.D., BOSTON, MASS.

IN PRESENTING this particular type of lingual wire technic, no claim is made for any originality in its construction, nor for it as a universal appliance, but rather claiming for it efficiency, simplicity, cleanliness and inconspicuousness in cases where its use is indicated. It is applicable in a great majority of cases where general development of the maxillary or mandibular arch is desired, obtaining this development in harmony with nature's plan as it is now understood from a biological viewpoint.

The general principle of the lingual wire, in whatever form it may be used, is so well understood that it is not necessary to dwell on it at length at this time, but in fairness to the younger practitioners, many of whom are being taught the use of only the so-called more modern appliance, they should have an opportunity to become acquainted with the principle of this very efficient appliance.

The word "necessary" in the title of the clinic might be changed to "advantageous" so the title would then read, "The Auxiliary Loop as an Advantageous Adjunct in the Lingual Wire Technic," for we are all well aware that the lingual wire is being used successfully without the auxiliary loop, though some do not believe to as great advantage as it might be if the principle of the loop were well understood and utilized.

Stability of the molar anchorage is very essential when using this form of lingual arch wire; and to obtain this stability, well-fitted molar bands made of a rigid material are used, with the occlusal buccal edge of the band reinforced with solder. The half-round tube properly placed gives a desirable attachment for the lingual wire. With this technic the activating influence in producing development is obtained by the main wire in contrast to the more commonly used lingual wire which utilizes the long auxiliary spring as the activating force.

Individual finger springs are used in cases where considerable movement is required, as in cases where an incisor or premolar is in linguoversion.

During the movement of these individual teeth the main body wire is enabled to continue its developmental action, if necessary, by periodic adjustments. When these individual teeth are moved into proper alignment, the finger spring is removed, the arch wire is annealed and reshaped in the mouth and made to conform to the new position of these teeth. The loop or working area is of great advantage when reshaping the wire and obviates the necessity of making a new arch wire. This type of lingual arch wire is

*Clinic given at the Thirty-Second Annual Meeting of the American Society of Orthodontists, Oklahoma City, Okla., Nov. 8-10, 1933.

equally efficient in deciduous, mixed or permanent dentures and the following case is shown to demonstrate its use.

Patient, nine years of age. Fig. 1 shows the right, front and left views of case before treatment was instituted. Mesial drift of both maxillary and

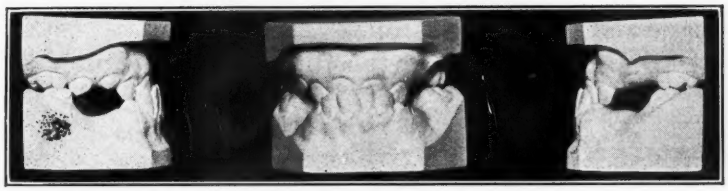


Fig. 1.

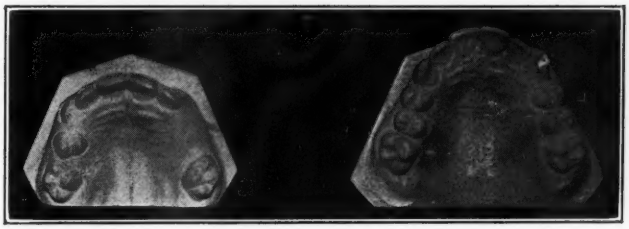


Fig. 2. Fig. 3.

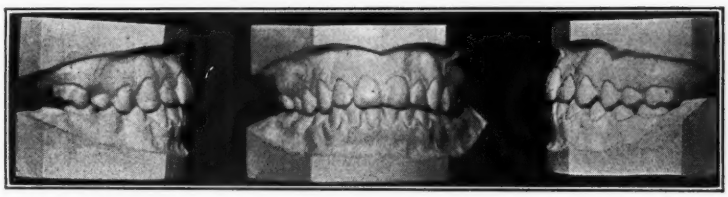


Fig. 4.

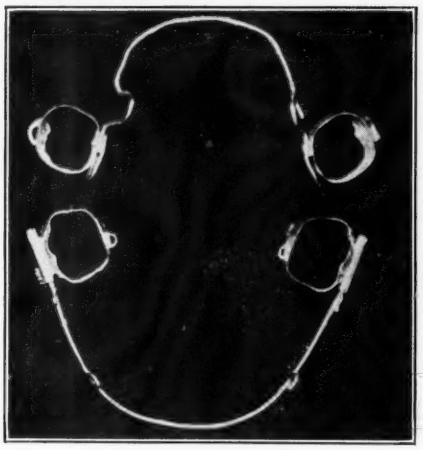


Fig. 5.

mandibular molars with lack of general development due to premature loss of deciduous teeth.

Fig. 2 shows occlusal view of maxillary arch before treatment. Fig. 3, occlusal view after treatment.

Fig. 4, right, front and left views of case after treatment.

Fig. 5, the appliances used in the treatment of the case.

The entire development of the maxillary arch was accomplished with the lingual arch wire, utilizing auxiliary loops as advocated.

A labial arch wire was used on the mandibular arch, to which intermaxillary elastics were attached to hooks placed opposite the canines and extending to hooks on the buccal surface of the maxillary molar bands.

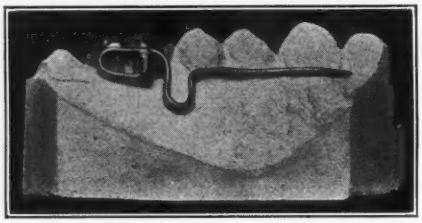


Fig. 6.

Only two loops are used on the lingual wire, these being placed one on each side of the arch opposite the second premolars.

Fig. 6 gives a lingual view of a section of a lingual arch wire showing the loop and molar attachment.

Success with this type of lingual arch can be obtained only by a careful study of the principles involved, being careful in its manipulation to make haste slowly and thereby prevent any undesirable molar disturbance.

VARIATIONS IN THE MUTUAL RELATIONSHIPS OF THE MAXILLARY AND MANDIBULAR GUM PADS IN THE NEWBORN CHILD*

LILAH CLINCH, L.D.S., R.C.S.I., ENGLAND

REFERENCES to this subject in the literature show considerable diversity of opinion as to the normal relations of the maxillary and mandibular gum pads; for example, Weinberger (1916) illustrated the relationships of the jaws to one another by a series of photographs of dried skulls of newborn

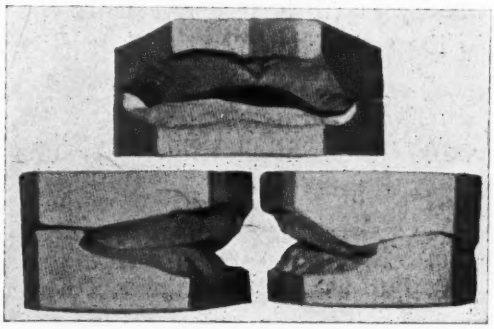
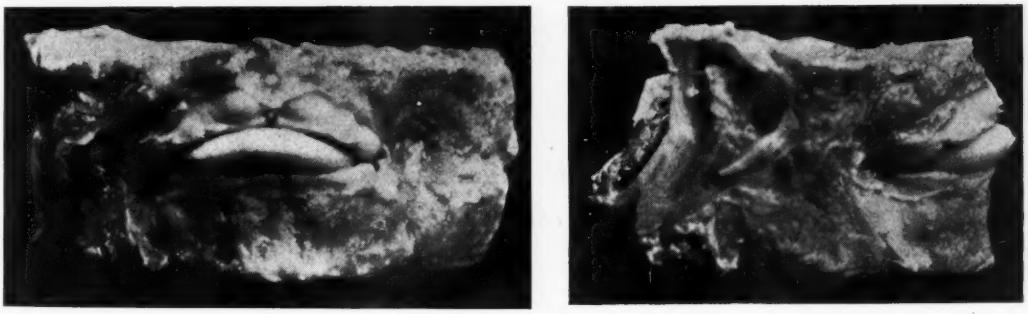


Fig. 1.—"Malrelations of the jaws at birth." (Hellman[3])



A. *B.*

Fig. 2.—*A* and *B*, "Alveolar gum pads at birth, showing space between pads in anterior region through which the tongue protrudes." (Friel.[2])

children, which showed all stages from protrusion to retrusion of the mandible. Hellman (1914) considered that a distal position of the mandibular gum pad, with a space in the future incisor region between maxillary and mandibular pads, as a malrelation (Fig. 1); Friel (1926) on the other hand believed that a space was normally present and showed that the tip of the tongue protruded through it (Figs. 2 *A* and *B*). Schwarz (1931) described the gum pads, but he made no reference to any space. Brash (1931) called attention to the disparity in the accounts. In view of the diversity of opinions mentioned above, it seemed to me to be worth while undertaking an investigation into the matter by examining a large series of living newborn children.

*Transactions of British Society for the Study of Orthodontics, 1932.

It is well recognized that what is a normal occlusion for the deciduous dentition may become abnormal for the permanent, and in the same way abnormal occlusion may, in rare cases, be followed by normal occlusion. In order to discover a form and relationship which would be followed by normal occlusion of both deciduous and permanent dentitions—and would presumably be normal—it would be necessary to follow up for years the different types which are met with at birth and which are described in this paper. Since, up to the present, no such investigation has been undertaken whereby a normal standard of the relationships of the gum pads may be laid down, it must be emphasized that in this paper only the various types of relationship, as found in 500 newborn full-term children, are described, and no attempt is made to assign normality to one type rather than another. Nevertheless, there are some cases which show such definite signs of abnormality that it is hard to refrain from predicting a similar type of abnormality in the succeeding phases of development.

METHODS

As a preliminary, 100 infants were examined and notes were taken on:

(1) The actual appearance of the gum pads, with reference to the descriptions given by West (1925).

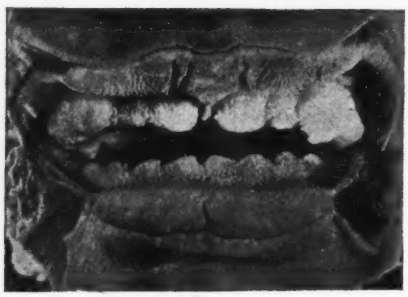


Fig. 3.—"Ventral view of mouth of fetus of thirty-one weeks, showing how segments of gum may resemble newly erupted teeth." (West.[7])

(2) The precautions necessary in approximating the gum pads so as to avoid putting undue pressure on any region, and to avoid any rotation of the mandible around the molar gum pad.

(3) The relationship of the mandibular to the maxillary pad.

The examination of these 100 infants was only of a preliminary character, and the results are not included in this paper. In the course of this examination it was found that before a detailed observation of the gum pads could be made it would be necessary to take impressions of the infants' jaws. To do this some small very light (aluminum) trays were procured which could be easily bent. These were first tried in the mouths of infants of about six months, and a number were bent into suitable shapes which could afterward be modified to suit any unusual case. Nadrag impression compound was the material used, because, when taken out of boiling water—in a perfectly suitable condition for taking impressions—it is only warm and never reaches a temperature which could cause any injury to the mouth. When preparing

the maxillary tray no impression material was put over the palatal portion, but in almost every case a satisfactory impression of the palate was procured, without any danger of choking. It was found most convenient to take the maxillary impression from the front, and, while the nurse held the infant and supported the head, the tray was inserted into the mouth, fixed in position, and pressure was exerted on its lower surface. The mandibular impression was also taken from the front. In order to occlude the models correctly, notes were taken on (*a*) presence or absence of a space in the incisor region, and, if present, the limits of the space on each side of the maxilla and in the mandible; this was made possible by the segmentation of the gums (Fig. 3); (*b*) the relation of the anterior margin of the first molar segment of the mandible to that of the maxilla.

Seventy pairs of impressions were taken in this way, and care was taken to observe whether this treatment had any adverse effect on the children, but none was noticed either by the doctor or by the nurses in charge.

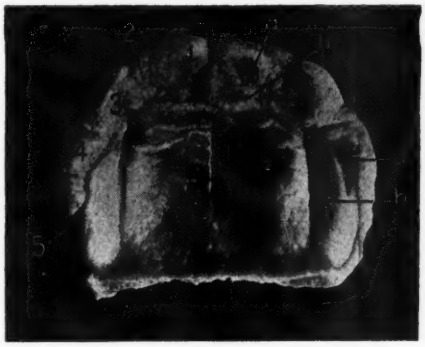


Fig. 4.

Fig. 5.

Fig. 4.—"Gums and palate of fetus of twenty-nine weeks, showing dental groove (*a*) and gingival groove (*b*) enclosing the rectangular palate, and the rough nodular surface of the five segments: medial incisor (1), lateral incisors (2), canine (3), first molar (4), and second molar (5)." (West.[7])

Fig. 5.—Outline of outer border of gum pad. Maximum and minimum size.

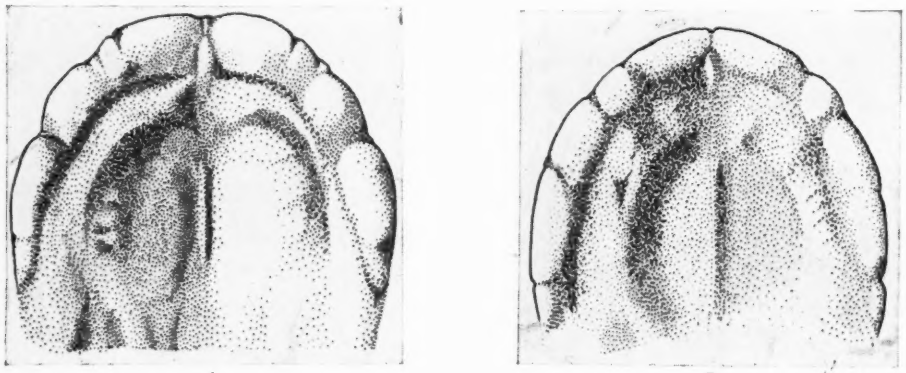
THE MAXILLARY GUM PAD (FIGS. 4, 5, AND 6)

The maxillary alveolar arch is marked along its whole length by a groove—the dental groove—which divides it into two parts, a lateral labiobuccal and a medial lingual portion; it is through the former of these that the teeth eventually erupt, and it is this portion which constitutes the definitive gum pad. This gum pad forms a horseshoe-shaped arch which, although it varies in size, is remarkably constant in outline. In a small number of cases a tendency to narrowness in the canine region (Fig. 6 *B*) is found, but it is scarcely noticeable and is negligible as compared with the narrowness often seen when the teeth have erupted. The gum pad is divided into ten segments which correspond to the central and lateral incisors, the canine and first and second deciduous molars of each side. The central incisor and canine segments are about equal in size and are well marked; they are separated from the smaller lateral incisor segment, which is indistinct and sometimes lies

lingual to them, by two shallow grooves. The first molar segment is the largest and is limited anteriorly by the lateral labial frenulum. The second molar segment is more difficult to recognize as it merges with the dental groove, but it can be made out lying somewhat lingual to the first molar segment, with its axis directed distolingually from before backward. The gum is everywhere solid and firm, similar to that condition of the gum after complete healing and absorption of the alveolus in a healthy edentulous adult.

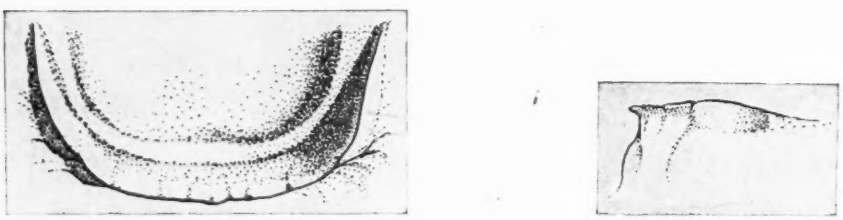
THE MANDIBULAR GUM PAD (FIG. 7)

The mandibular alveolar arch, like the maxillary, is divided into a medial lingual and a lateral labiobuccal portion, or gum pad. Though a similar seg-



A *B*

Fig. 6.—Drawing of maxillary arches: *A*, normal, and *B*, narrow; showing segmentation, dental groove and gingival groove. (×1.5.)



A *B*

Fig. 7.—Drawing of mandibular arch: *A*, from above, showing segmentation, dental groove and gingival groove; *B*, from side, showing segmentation, everted edge and the first molar segment raised above the level of the incisor segments. (×1.5.)

mentation is found, the shape of the whole arch is not the same as in the maxilla, but is more U-shaped or rectangular in form, so that the whole arch can be divided into an anterior and two lateral parts, the anterior part being formed by the four incisor segments, while the lateral parts are formed by the four molar segments, the canine segment lying in the angle between the two parts.

The anterior part is comparatively broad and is sometimes everted in front, while each lateral part has a narrow edge and is raised above the level of the anterior part. The gum is hard and firm, as in the maxilla, but the everted edge in the incisor region, when present, is a thin flap which can be easily depressed; the segments are not so well marked as in the maxilla.

THE TEMPOROMANDIBULAR JOINT, AND RELATIVE NECESSARY PRECAUTIONS

The temporomandibular joint of the newborn child is not such a secure structure as in the adult, for the reason that there is no articular eminence, and the glenoid fossa is practically flat. A postglenoid tubercle is present, but it is hardly sufficient to prevent dislocation of the jaw, so that the whole articulation depends for its stability on the strength of the ligaments surrounding the joint. Attention has been called to the fact that the molar segments of the gum pad stand up above the level of the canine and incisor segments, and it can thus be seen that if an attempt is made, without due care, to approximate the gum pads in the incisor region, the molar segments will act as a fulcrum around which the jaw will rotate, with a tendency, when the incisor regions of the maxilla and mandible are approximated, to withdraw the condyle from the shallow glenoid fossa. On this account it was necessary to discover how much force could be exerted in approximating the gum pads without displacing the condyle, and it became evident that if blanching of the pads occurred the pressure was excessive. It was only with much practice that it was possible to be confident that undue pressure was not being used, and the nurses who assisted became very expert in holding the mandible in position while the examination was being made.

RELATIONS OF MANDIBULAR TO MAXILLARY GUM PAD

In the 400 children who were examined, subsequent to the 100 experimental cases, the relations of maxillary and mandibular gum pads fell into three main classes:

(1) Those in which the mandibular arch was slightly lingual to the maxillary arch in the incisor and in the molar regions; this class comprised 280, or 70 per cent.

(2) Those in which the mandibular arch was slightly lingual and distal to the maxillary in the molar region, but definitely distal in the incisor region; this class comprised 108, or 27 per cent.

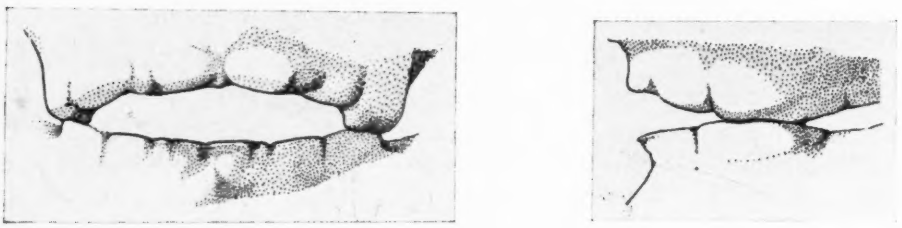
(3) Those in which the mandibular arch was definitely lingual and distal in both molar and incisor regions; this class comprised 12, or 3 per cent.

Type 1.—(Figs. 8 and 9).* In all cases of this type the pads meet in the region of the molar segments just as, later on, provided the occlusion is normal, the mandibular molars lie lingual to the maxillary; the anterior margin of the first molar segment lies slightly anterior to the anterior margin of the maxillary first molar segment. The members of this Type 1 are divided into: (*a*) those who have a vertical space in the incisor region; (*b*) those who have not a vertical space in the incisor region.

Subclass (*a*) contains 204, or 73 per cent, of the total of 280 in this Type 1. The space in the incisor region is that which has been figured by Friel and considered by him to be normal. It extends backward as far as the

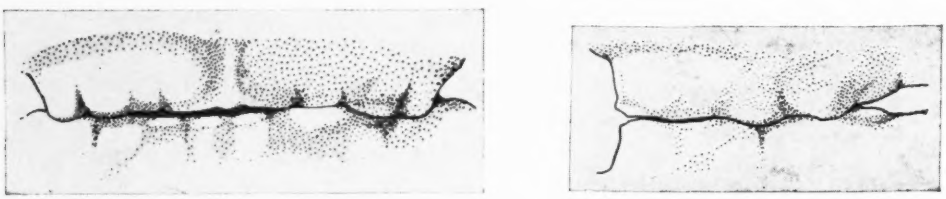
*Photographs of the models, from which Figs. 8-17 have been drawn, are included at the end of the paper.

canine segments, and is produced by a distinct flattening of both maxillary and mandibular gum pads; the mandibular pad in the incisor region is particularly broad anteroposteriorly and forms a shelf on which the tip of the tongue lies during rest.



A *B*

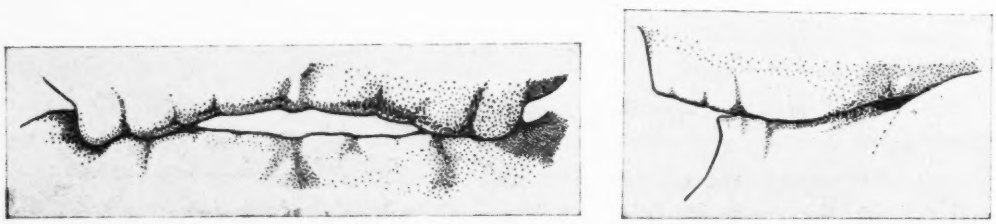
Fig. 8.—Drawing of gum pads in occlusion. Type 1, Subclass A. Mandibular arch slightly lingual to maxillary arch in both incisor molar regions. Vertical space in incisor region. *A*, Front view; *B*, side view. (×1.5.)



A *B*

Fig. 9.—Drawing of gum pads in occlusion. Type 1, Subclass B. Mandibular arch slightly lingual to maxillary arch in both incisor and molar regions. No vertical space in incisor region. *A*, Front view; *B*, side view. (×1.5.)

Subclass (*b*) contains 76, or 27 per cent, of the total of 280 in this Type 1. In these cases the flattening in the maxillary incisor regions is not found; but the edge of the mandibular incisor gum pad is everted, and it is on this everted shelf that the tongue lies. In order to enable the tongue to come to lie between the pads, a tilting of the mandible takes place around the molar segments as a fulcrum, as was described above.

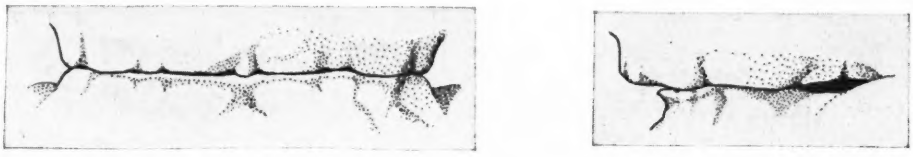


A *B*

Fig. 10.—Drawing of gum pads in occlusion. Type 2, Subclass A. Mandibular arch slightly lingual and distal to maxillary arch in molar region and definitely distal in incisor region. Vertical space in incisor region. Space less than in Type 1, Subclass A. *A*, Front view; *B*, side view. (×1.5.)

Type 2.—(Figs. 10 and 11.) The essential features of this type are that the mandible appears to have undergone an actual distal displacement,

whereby the anterior borders of the mandibular molar segments, instead of being anterior, come to lie posterior to the anterior borders of the corresponding segments of the maxilla, and, indeed, in many cases the children show a decided appearance of mandibular retrusion. This type may be divided as in Type 1: (*a*) those who have a vertical space in the incisor region; this subclass contains 46, or 42 per cent, of the total 108 of Type 2; (*b*) those who have not a vertical space in the incisor region. This subclass contains 62, or 58 per cent, of the total 108.



A *B*

Fig. 11.—Drawing of gum pads in occlusion. Type 2, Subclass B. Mandibular arch slightly lingual and distal to maxillary arch in molar region and definitely distal in incisor region. No vertical space in incisor region. *A*, Front view; *B*, side view. (×1.5.)

In this type the mandibular gum pad in the incisor region is not in contact with the maxillary arch because of the distal position of the mandible; on this account it is more difficult to distinguish those cases in which a vertical space is present; actually there is always a space, but in subclass *b* it is bounded above by the palate and is not visible from the front as in subclass *a*.

In all these cases the tongue lies on the mandibular pad and the tip does not usually come as far forward as the maxillary incisor segments, but lies pressed behind them.

A *B*

Fig. 12.—Drawing of gum pads in occlusion. Type 3. Mandibular arch definitely lingual and distal in both molar and incisor regions. No vertical space in incisor region. *A*, Front view; *B*, side view. (×1.5.)

Type 3.—(Fig. 12.) Though the number of cases falling into this type is small, they do seem to form a definite class apart from Types 1 and 2. In these cases the mandibular pad is smaller over its entire area than the maxillary, and seems to fit up into the palate so that no space is possible anywhere, as the maxillary segments everywhere overhang the mandibular. The tongue is very small and lies pressed up against the hard palate, very distal to its position in Types 1 and 2.

With reference to Weinberger's paper, mentioned above, the author was unable to find one case of mandibular protrusion among all the 500 children examined.

TABLE I

COMPARISON OF THE NUMBERS IN TYPE 1 (SUBCLASSES A AND B), TYPE 2 (SUBCLASSES A AND B) AND TYPE 3

	A (with space.)	B (without space.)	Total.
Type 1.	204 (73%)	76 (27%)	280 or 70%
Type 2.	46 (42%)	62 (58%)	108 or 27%
Type 3.		12	12 or 3%
	250	150	400

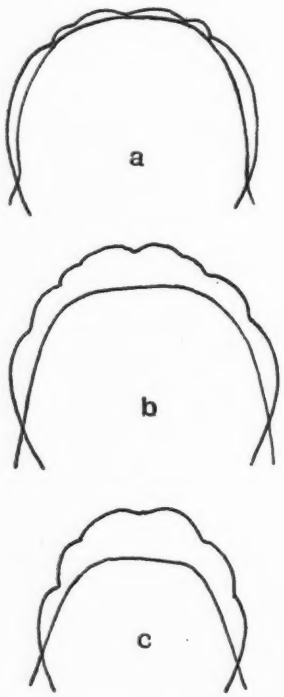


Fig. 13.—Outlines of outer borders of gum pads. (*a*) Type 1, (*b*) Type 2, (*c*) Type 3.

It is of considerable interest to notice that it is always the molar segments of the gum pads which are in occlusion (Fig. 14), but the incisor teeth of maxilla and mandible are the first to erupt, and where a space is present in 62 per cent cases, there is room for this to occur (Figs. 14 and 15). When the incisors are nearing full eruption, the space is maintained by respective upward and downward growth of the mandibular and maxillary molar segments; the degree of overbite appears to depend on the presence or absence of the vertical space in the incisor region between the gum pads.

A few measurements were taken on the models, between well-defined points. Each measurement, or character, was chosen to illustrate the differences in size and shape which have already been described. Also, as far as

possible, the various measurements were taken in a manner comparable with that employed by Miss Smyth in her investigation on children of two to five years. The results obtained have been analyzed statistically by Dr. M. Young, and his tables and comments are appended. It will be seen that although the numbers of cases in the various groups are comparatively small, yet in several instances there are differences which are statistically signifi-

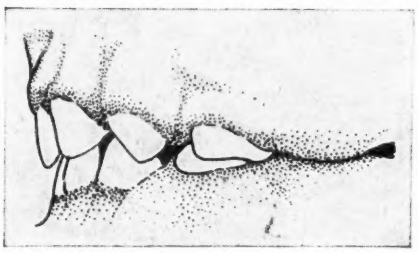
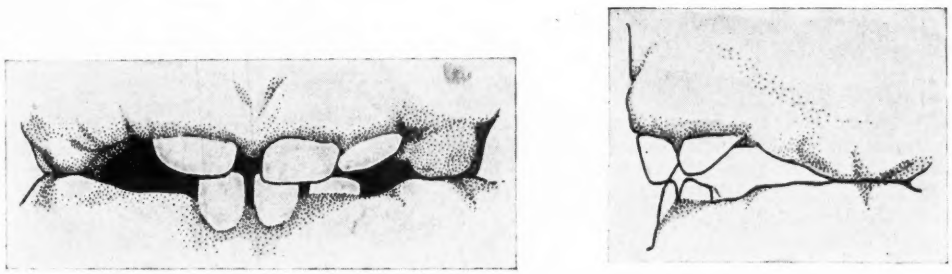
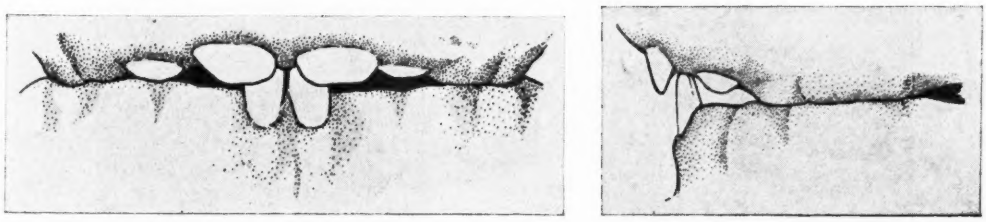


Fig. 14.—Drawing of side view of arches in occlusion, eighteen months, showing second molar gum pads in occlusion. (×1.5.)



A *B*

Fig. 15.—Drawing of (*A*) front and (*B*) side views of arches in occlusion, thirteen months, showing vertical space in incisor region. Normal overlap of maxillary incisors over mandibular incisors. Molar gum pads in occlusion. (×1.5.)



A *B*

Fig. 16.—Drawing of (*A*) front and (*B*) side views of arches in occlusion, thirteen months, showing slight vertical space in incisor region, but not sufficient to prevent an excessive overlap of maxillary incisors over mandibular incisors. Incisal edge of mandibular incisors in occlusion with maxillary gum. Molar gum pads in occlusion. (×1.5.)

cant. It is also of interest to note that the correlation between one pair of characters in the present investigation is almost identical with the comparable correlation in the children of two to five years already mentioned. The details are described by Dr. Young.

I should like to express my thanks to Dr. Solomons, the Master of the Rotunda, for allowing me to carry out this work in the hospital, and to Sister Clery for putting every facility at my disposal.

I am also indebted to Professor Brash and Professor West for the loan of slides; to Professor Dixon for demonstrating to me the changes in the temporomandibular joint in skulls in the Anatomical Museum of Trinity College, Dublin; to Dr. Northcroft for advice and for having articulators made for the models; to Dr. Friel for the loan of slides, for suggesting that this work should be done, and for his help in planning it; to Miss Smyth for her advice and help in measuring the models.

Special thanks are due to Professor West, Dr. Northcroft, Dr. Friel, Mr. McKeag, Mrs. Lindsay and Miss Smyth for reading this paper and giving many valuable suggestions.

The drawings are the work of Miss E. C. Humphreys.

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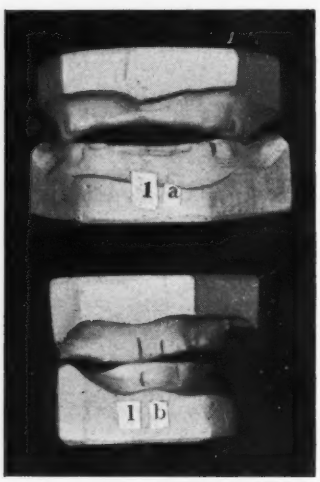
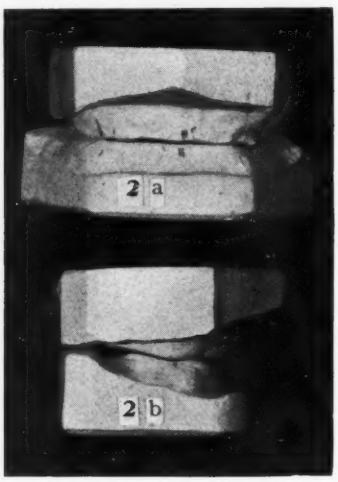
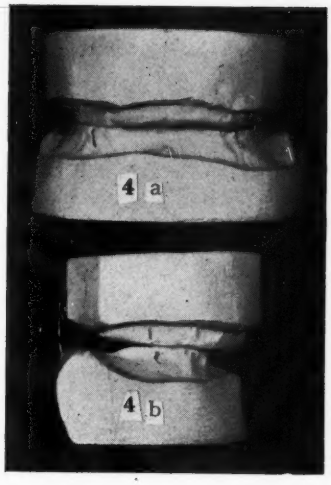
PHOTOGRAPHS OF THE MODELS FROM WHICH FIGS. 8 TO 16 HAVE BEEN DRAWN





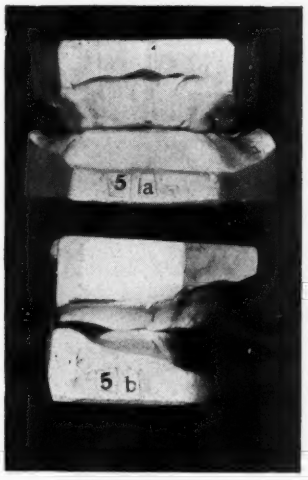
No. 1.—Gum pads in occlusion. Type 1, Subclass A. Mandibular arch slightly lingual to maxillary arch in both incisor and molar regions. Vertical space in incisor region. (*a*) Front view. (*b*) Side view. Age four days.

No. 2.—Gum pads in occlusion. Type 1, Subclass B. Mandibular arch slightly lingual to maxillary arch in both incisor and molar regions. No vertical space in incisor region. (*a*) Front view. (*b*) Side view. Age four days.



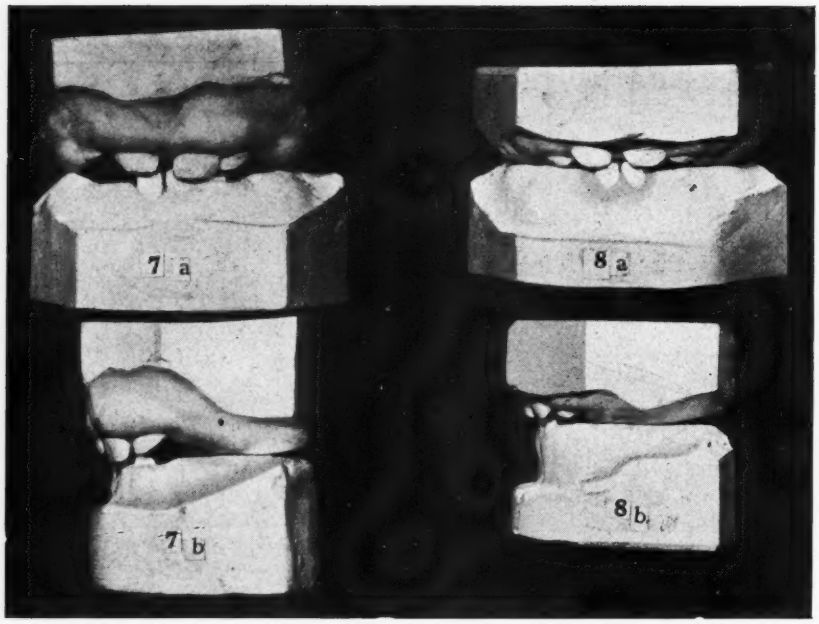
No. 3.—Gum pads in occlusion. Type 2, Subclass A. Mandibular arch slightly lingual and distal to maxillary arch in molar region, and definitely distal in incisor region. Vertical space in incisor region (space less than in Type 1, Subclass A). (*a*) Front view. (*b*) Side view. Age three days.

No. 4.—Gum pads in occlusion. Type 2, Subclass B. Mandibular arch slightly lingual and distal to maxillary arch in molar region, and definitely distal in incisor region. No vertical space in incisor region. (*a*) Front view. (*b*) Side view. Age five days.



No. 5.—Gum pads in occlusion. Type 3. Mandibular arch definitely lingual and distal in both molar and incisor regions. Overlap of maxillary incisor segments over mandibular incisor segment. (*a*) Front view. (*b*) Side view. Age five days.

No. 6.—Side view of arches in occlusion, showing gum pads in occlusion in the region of the second deciduous molar segments. Age eighteen months.



No. 7.—Models in occlusion, showing vertical space in incisor region, normal overlap of maxillary incisors over mandibular incisors, molar gum pads in occlusion. (*a*) Front view. (*b*) Side view. Age thirteen months.

No. 8.—Models in occlusion showing slight vertical space in incisor region but not sufficient to prevent excessive overlap of maxillary incisors over mandibular incisors. Incisal edge of mandibular incisors in occlusion with maxillary gum. Molar gum pads in occlusion. Age thirteeen months.

The following section is included by kind permission of Dr. Matthew Young.

DESCRIPTION OF CHARACTERS

Maxilla

No. 1. Depth of palate from highest point of first molar segment.
No. 2. Length of arch from the labial portion of crest of incisor ridge to the most distal point of second molar segment.
No. 3. Breadth of arch at distal canine groove, buccal side.
No. 4. Breadth of arch at widest portion of first molar segment, buccal side.

Mandible

No. 5. Length of arch from the labial portion of crest of incisor ridge to the most distal point of second molar segment.
No. 6. Breadth of arch at distal canine groove, buccal side.
No. 7. Breadth of arch at widest portion of first molar segment, buccal side.

In Table II are shown the mean measurements of the characters in the comparable groups. Though many of the pairs of averages compared appear to show appreciable differences, only four of the differences are of such a size that on the numbers available they can be considered real or significant when tested by the appropriate method for small samples. The means where the differences may be considered real are underlined. The mean breadth of the arch at the distal canine groove in both the maxillas and mandibles (Nos. 3 and 6) in Group 2 A is significantly in excess of the corresponding breadth

TABLE II

SHOWING A COMPARISON OF THE MEAN MEASUREMENTS OF THE CHARACTERS IN THE DIFFERENT GROUPS

TYPES	CHARACTERS NO. 1.	NO. 2.	NO. 3.	NO. 4.	NO. 5.	NO. 6.	NO. 7.
1A	7.42 (19)	21.06 (19)	25.58 (19)	31.21 (19)	17.43 (19)	21.79 (19)	26.37 (19)
1B	6.73 (13)	20.84 (12)	24.62 (13)	30.00 (13)	18.63 (12)	21.54 (13)	25.62 (13)
2A	7.15 (13)	21.82 (12)	25.38 (13)*	29.77 (13)	16.94 (12)	23.23 (13)*	26.77 (13)
2B	8.04 (12)	21.28 (8)	23.50 (12)	29.83 (12)	15.48 (8)	21.33 (12)	25.67 (12)
1 (A+B)	7.14 (32)	20.98 (31)	25.19 (32)	30.72 (32)	17.90 (31)*	21.69 (32)	26.06 (32)
2 (A+B)	7.58 (25)	21.60 (20)	24.48 (25)	29.80 (25)	16.31 (20)	22.32 (25)	26.24 (25)
A (1+2)	7.31 (32)	21.35 (31)	25.50 (32)*	30.69 (32)	17.24 (31)	22.38 (32)	26.53 (32)
B (1+2)	7.36 (25)	21.02 (20)	24.08 (25)	29.92 (25)	17.48 (20)	21.44 (25)	25.64 (25)
3	8.75 (4)	20.50 (1)	24.00 (4)	29.50 (4)	16.00 (1)	19.50 (4)	22.75 (4)

*Only those means which are underlined can be considered to differ to a significant degree in the number available.

in Group 2 B. The same mean breadth in the maxilla in Group A (1 + 2) is significantly in excess of that in Group B (1 + 2).

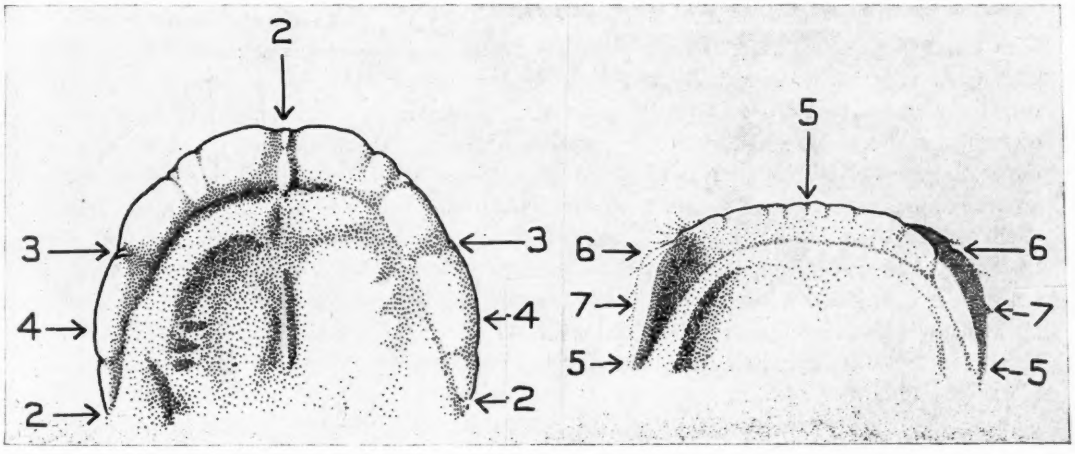


Fig. 17. Fig. 18.

Fig. 17.—Drawing of maxillary arch, showing points of measurement. (×1.5.)
Fig. 18.—Drawing of mandibular arch showing points of measurement. (×1.5.) These correspond with the characters described.

The mean length of the arch in the mandible in Group 1 (A + B) is significantly greater than the corresponding length in Group 2 (A + B).

The averages in Group 3 are based on such small numbers of observations that no comparison between them and the corresponding values in the other groups is warranted.

The interrelationship of the several pairs of characters may be of interest and is shown by the correlation coefficients which are given in Table III. The correlation between the lengths of the maxillary and mandibular arches is represented by a coefficient of .69 which is practically identical with that found between the closely analogous measurements in children from two to five years. The correlation between the length and width of the maxillary

TABLE III

SHOWING THE CORRELATION COEFFICIENTS (r) FOUND BETWEEN THE SEVERAL PAIRS OF CHARACTERS AND THOSE FOUND BETWEEN CLOSELY ANALOGOUS MEASUREMENTS IN CHILDREN FROM 2 TO 5 YEARS OF AGE

CHARACTERS	r	CHILDREN 2 TO 5 YEARS (MISS SMYTH'S DATA) r
Nos. 2 and 5	.690 ± .073 (52)	.653 ± .062 (87)
Nos. 2 and 4	.547 ± .097 (52)	.246 ± .100 (88)
Nos. 5 and 7	.178 ± .134 (52)	.361 ± .093 (88)
Nos. 3 and 4	.709 ± .064 (61)	—
Nos. 6 and 7	.720 ± .062 (61)	—
Nos. 1 and 4	.090 ± .127 (61)	.144 ± .106 (86)

arch is moderately high, about .5, but there is no significant association between the corresponding characters in the mandible. There is no appreciable association between the width of the arch and the height of the palate.

DISCUSSION

Dr. Sheldon Friel remarked that such an investigation required a considerable amount of pluck: to take one hundred impressions of infants under eight days of age and to examine an additional four hundred infants; it was, however, the large numbers which made Miss Clinch's paper so valuable and gave her conclusions and observations so much weight. This work was not, he continued, of purely academic importance; it was of great practical value, for it filled a gap and straightened a confusion in our knowledge of the stages of occlusion, and anything that increased the knowledge of occlusion was of great practical importance to orthodontics. Not only had Miss Clinch filled that gap, but she had opened up several new avenues for future research. Two of these new lines had struck the speaker as important, and the first of them was the large percentage of postnormal cases. Were these cases, he asked, a definite inhibition of growth of bone which would afterward be shown when the teeth erupted, or were they merely a delayed development which would catch up with the normal by the time the teeth erupted? A considerable amount of research would be needed to follow up these cases, and it would be necessary to know something more about the stages of development in the embryo. The second line of research which he thought important was the meaning of the space in the future incisor region. Miss Clinch had put forward a very plausible explanation: that it had to do with the amount of overlap of the maxillary over the mandibular incisors. He thought that there existed a certain amount of support for that view, apart from what she had told the meeting, in the very large percentage of the space present in the cases that had normal anteroposterior relationship and the very large percentage of lack of the space in those with a posterior relationship. As was well known, postnormal occlusion and close bite were very closely related, and it seemed quite possible that Miss Clinch had hit upon the first evidence of close bite. Many things had been said from time to time about the narrow viewpoint of specialists in orthodontics. It had been held that unless they kept the thirty-two teeth in the patient their case was a failure. Dr. Friel said that he did not think that this remark was true. Orthodontists, particularly the specialist members of the Society, realized just as much as any other dental surgeon, and possibly even more, that any definite inhibition of growth of bone seldom completely recovered, and that a perfect result could not be obtained without the removal of certain teeth in these very difficult cases. A specialist in orthodontics was not only one who practiced the art exclusively—a very minor point—but one who had the necessary manipulative ability, and, above all, one who was willing to undertake research work and hand on the knowledge to his fellows. The specialists of the Society had tried to live up to that standard, and Miss Clinch, a member of the small band of London specialists, was no exception.

Mr. Northcroft said that the observation of five hundred cases of infants at this very early age displayed an amount of patience that was seldom found. Speaking personally, he had become tired after taking models from a mere hundred children between the ages of two and five years; what it must be to take impressions of four hundred infants between two and four days old he left to the imagination. He had taken some impressions of his own first born boy at the age of fourteen days, using the old-fashioned yellow beeswax, which he had found a very satisfactory substance. Nadrag had not been invented in those days, and even so he would have hesitated to use it. The difficulty was that the plastic substance must remain soft for some little time, because the surgeon had to seize his opportunity when the infant was crying to pop the mold into its mouth; the taking of these impressions was quite a problem. The speaker said that he had had to make his own impression trays; he asked whether Miss Clinch had found any on the market or whether she had made all her own trays. He had not realized at first how tiny the trays had to be, and only found out by experiment. Miss Clinch had demonstrated very clearly the classes into which her cases fell. Mr. Northcroft agreed that the apparently open space in the front of the mouth in which, as Dr. Friel had shown, the tongue protruded, occurred in the cases which were not going to have a close bite later on—and all members knew what a terrible bugbear the close bite was in later orthodontic work.

Mr. S. A. Riddett inquired whether Miss Clinch's Type 1 cases were mostly followed by normal occlusion, and if Type 2 were the smaller number which might or might not be followed by postnormal occlusion. He asked whether the Type 2 space was considerably smaller than the Type 1.

Mr. A. L. Packham then asked if the lecturer would explain how she had articulated the models. In infants four days old the glenoid cavity was practically a plane surface, and therefore the condyle of the mandible could move in practically every direction. It could certainly move forward, and even if it could not move backward, it could move to the left or right. Most members would have experienced considerable difficulty in articulating correctly the two models of an edentulous elderly patient; one could assume therefore some difficulty in estimating the exact occlusion of the models in question. He inquired how Miss Clinch could say that the two models were in the position of rest. It had also occurred to him, he said, that the space between the maxillary and mandibular gum pads might be associated with the act of sucking. It was not actually unknown for a child to be born sucking its thumb, and he had heard of infants who had sucked their thumbs on the first, second and third days of life.

Mr. McKeag suggested that he could supplement Miss Clinch's explanation of how the accurate articulation was recognized. She had kindly allowed him to accompany her to the hospital where she had been making the investigation and he had realized how difficult the work was, and also that it was quite possible to be satisfied that the gum pads were in their natural relationship. The comparison with edentulous jaws was not a fair one, because edentulous jaws were not made to fit together and did not naturally fit together, and gave the observor that impression at once. While it was obviously necessary to have, as Miss Clinch had, a standardized technic for getting the relationship, that technic was necessary for maintaining the same angle of view, and did not seem to be important for recognition of the correctness or otherwise of the relationships of the jaws.

Miss Clinch in reply to Dr. Northcroft said that she had found it necessary to make the trays herself; she had done so by cutting down larger sized trays to suitable shapes. She would like to assure the President that the illustrations were photographs of genuine models; as none of the children had been over eight days old, she had not inquired for thumb-sucking habits.

Mr. Packham had asked a question which could only be satisfactorily answered by a demonstration on an infant; there was undoubtedly a definite bite, but it was only after the examination of a considerable number of children that one became convinced of this;

having once discovered this fact, it was comparatively easy to place the mandible in its position of rest—using in every case the same technic. The children, strange to say, did not seem to object to the examination, and many of them made no protest. Mr. Packham had said that the space in the incisor region might be associated with the act of thumb-sucking. As all the infants were under eight days of age, she thought this was improbable—indeed, many of the children one and two days old had pronounced spaces; of course, if the infant had been born sucking its thumb, the matter was different, but she did not think that this could occur in such a large percentage of cases without some mention of it being made in the literature.

She was afraid she could not reply to Mr. Riddett's question as to whether the Type 1 cases were followed by normal occlusion; she hoped to continue this work and to follow up some cases from each type; when this had been done, more information on that point would be available. The space, when present, in cases of Type 2, was considerably smaller than in Type 1.

MOVING TEETH OVER THE BITE*

MURIEL P. MICHAELIS, L.D.S., ENGLAND

IT IS the widespread belief among dental surgeons that it is necessary to open the bite, usually by capping some of the teeth, in order to move buccally a tooth which is lingually misplaced or "inside the bite." As a generalization this is erroneous, but I am assured of its prevalence by Mr. Chapman's reply when I mentioned this communication to him. He told me that the idea is such a fixed one that unless one made oneself very convincing, one would not be generally believed.

The illustrations will show what I mean and will prove that the movement can be accomplished without opening the bite. I have chosen these three particular cases because they exemplify the type of irregularity which apparently, at any rate to the timid among us, cries out for the opening of the bite. Also, because the treatments carried out include the use of both fixed and removable appliances—and it is the user of removable appliances who is the harder to convince. The habitual user of finger springs on lingual and buccal bows is already among the converted.

The illustrations are intended to show the point in question only. The models show other irregularities, which have or have not been treated as the cases demanded; but we are not concerned with those here, and I shall ask you please to ignore them.

Fig. 1 shows a case in which the left permanent lateral incisor and deciduous canine are well inside the bite, and the left permanent central incisor, although rotated and lingually misplaced, is in a more or less edge-to-edge occlusion with the mandibular central. Fig. 2 shows the same case eleven months later. There had been no treatment in the interval owing to illness, and you will see that the central incisor is more or less normal in position, but that the lateral incisor is still lingually misplaced. Treatment to move the lateral incisor buccally was accomplished by means of a removable vulcanite saddle plate carrying a platinized gold bar lingual to the incisors, on which was soldered a finger spring exerting pressure at the neck of the lateral incisor. Anchorage was obtained by wire cribs round $\underline{6|6}$, carrying Visick clasps. Fig. 3 shows the position of the lateral after treatment.

Fig. 4 shows a lingually misplaced canine erupting rather late. This was treated by a similar plate, with a result as shown in Fig. 5.

Fig. 6, which shows the third case, takes rather an unfair advantage of you, I am afraid, because I have not got the final model as yet. The case is under treatment, and if members are interested I shall gladly show the result later. It is being treated with fixed appliances, two lingual bows carrying finger springs. I shall ask you to believe that so far all is going well.

*Transactions of British Society for the Study of Orthodontics, 1932.

In none of these cases has the bite been opened at any time, and treatment along these lines, as opposed to one which necessitates opening the bite, obviates unnecessary interference with the occlusion and minimizes the discomfort of the patient. It also allows in the case of a removable appliance, of a plate being so shaped as to come in contact with a minimum of dental tissue.

Fig. 1.

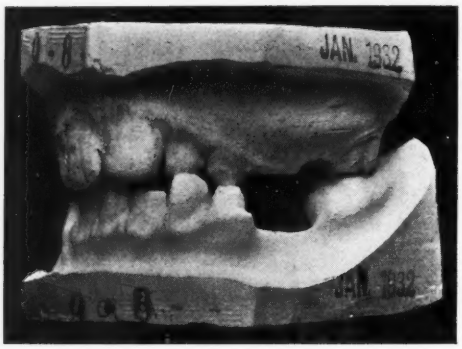


Fig. 2.

Fig. 3.

Fig. 4.

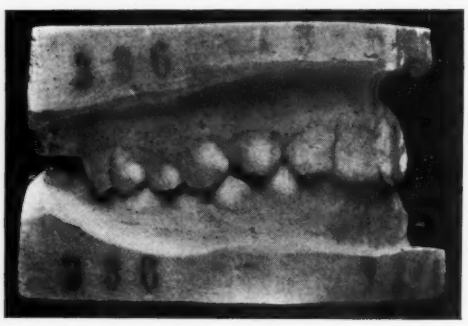


Fig. 5.

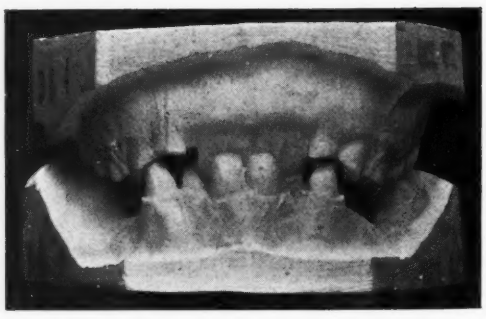


Fig. 6.

The whole misconception probably arises from our failing to appreciate the fact that the teeth are not normally kept clenched. Even with the lips closed the maxillary and mandibular teeth are slightly apart; but as this is not apparent on our models we are likely to overlook it. The difficulty is in

that way a psychologic one, and unless we recognize this essential difference between the model, which is passive, and the mouth, which is active, we are likely to perpetrate the fallacy of treating a model instead of a mouth.

DISCUSSION

Mr. H. G. Watkin said that he had had one case in a fairly young child of a maxillary central incisor inside the mandibular central incisor, with rather a large overbite. Without trying to gag the bite at all, but slowly moving the maxillary incisor forward, he had found that the mandibular central incisor had moved at the same rate by occlusion and had kept in front of the maxillary tooth, so that the speaker had not succeeded in getting the maxillary central over the mandibular by this method. He admitted that it was very seldom necessary to gag the bite, but there were times when it was so, particularly when there was a very large overbite in the front. In another of his cases on one side an upper molar occluded lingually and on the other side the molars occluded normally. He had had four teeth on a bow on one side working against the lingually placed molar on the other; the four teeth had all moved out, leaving the molar on the other side still biting lingually.

Dr. Broderick inquired, whether there was not a certain length of time during which the patients were unable to close their molar teeth, even if it were only for an hour or two.

Mr. R. Cutler (Honorary Secretary) added to Dr. Broderick's question that it was characteristic of these patients to complain of the teeth that were being moved being tender for two or three days, though treatment might be going on for some weeks, this tenderness marking the time of transition when the bite was edge to edge.

Mr. S. F. St. J. Steadman doubted whether the last remark was quite correct. He thought that the tooth, as it was moved, became tender and the patient bit in such a way that he bit on the tender tooth. It was a bite of accommodation. The tooth was never quite edge to edge, because that would imply that it was shorter when it was being moved over the bite. It was, however, quite easy to move the teeth laterally over the bite.

The President related that Mr. Fox, a very old member, had shown a case, to the Society, of a young lady who had desired to be married. He had fitted an inclined plane on the lower plate, and had said that on her wedding day she had looked "perfectly lovely." The case had shown what could be done by the cooperation of the patient.

Mrs. Michaelis, in reply, said that she had not anticipated that her communication would rouse such a storm of protest. She did not like to contradict so senior a member as Mr. Watkin, but she suggested that if an appliance had been put in the mandibular denture to prevent the teeth from moving forward, it would have been unnecessary to open the bite. She felt that opening the bite would do more harm possibly even to the temporomandibular joint, than the wearing of another appliance to prevent the mandibular teeth from moving forward at the same time. She did not know the length of the time during which the patient could not close his teeth, but she had not heard of any complaint.

Dr. Broderick asked whether it would be hours or weeks.

Mrs. Michaelis, answered that it could not be very long, but that she could not give an authoritative answer, except that she had not heard of any complaints of inability to close. If the finger-springs did not exert too much pressure, there should be neither pain nor tenderness in the tooth being moved. None of her patients had complained of pain, but the process had not been hurried; two or three months had been taken for each tooth, and there had been a very slow finger-spring movement.

DEPARTMENT OF
DENTISTRY FOR CHILDREN

THE CLINICAL ASPECT OF THE CONDUCT OF A DENTAL PRACTICE FOR CHILDREN*

C. B. Bray, D.D.S., Birmingham, Ala.

FOR the past one hundred years much progress has been made in scientific medicine and dentistry. In comparatively recent years much knowledge has been gained which has lengthened the span of life to almost double, as a result of the tremendous conservation of life in infancy, childhood, and youth, by the control of dysentery, typhoid, tuberculosis and other kindred diseases or infections. In the last twenty-five years the dental profession has become more child conscious than ever before. Many new ideas have been advanced through other lines of dentistry as well; some have been permanent, others have met with less favor and new ones have taken their places. It seems, however, that the one that has been the most helpful and one of dentistry's greatest achievements has been along the lines of focal infection. With it came the realization that dental conditions played a major part from a health standpoint, as well as a mechanical one.

In former years the dentist was not called upon to assist in diagnosis of medical cases as he is today; the medical profession has come more and more to appreciate the dentist's assistance in diagnosis in many cases. I think that this, probably, as much as any other one thing, has been responsible for the profession's becoming child conscious, from a dental standpoint; that, coupled with the fact that the laity has been gradually educated to prevention, of not only dental diseases but others as well.

Our rapid strides in the profession, our public health workers, who have done such noble work in recent years, and all of the other agencies that are teaching hygiene and clean living, have brought us automatically to an age of prevention. Advertisements that have been well written and which carry with them convincing pictures of overnight cures have also played their part. In many instances they have been harmful as well, because the public is easily misled with many of these convincing stories and has been made to believe that certain remedies were magic in their cure. They have, nevertheless, been responsible for many questions being asked and information being sought that otherwise would not have been brought to the public's attention. All these facts have made

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it easier to convince parents that dental care for children is necessary. This has been one of the stumblingblocks in successful dentistry for children in former years.

It has now been successfully demonstrated that children with diseased mouths are greatly handicapped, from an educational standpoint as well as a physical one. This, of course, is nothing new to dentists, but I believe it is of value to keep it constantly before the profession. The dental journals are giving considerably more space to this line of thought, and books are being written about the dental care of children, which in former years was unheard of. It has become a field of its own. Every dentist is paying more attention to the practice of children than ever before.

The average child is not difficult to handle, a statement which may be challenged but which is true nevertheless. It has been my belief that if we accomplish much in the way of prevention of dental caries, we must begin in the early stages of pregnancy. When we realize that teeth begin to form in the early months of pregnancy, why should we not begin to lay the foundation for better teeth in the prospective individual? Certainly we can do our most effective work, from a dietary standpoint, then and before dentition is completed. I shall not attempt to deal with any phase of diet except to say that it should be borne in mind that knowledge of vitamins, of nature's functions and total effects, is far from complete. Most of the information regarding them comes from animal experiments, and the results are not always the same in man as in animals. We know, of course, that rickets may be cured through proper diet, cod liver oil, and sunshine, all of which contain the necessary vitamins of bone building qualities. The average child, I believe, today is fed a balanced diet. There are, of course, exceptions to the rule. Yet we find dental caries ever present, and I do not believe that after dentition is complete we will be able to correct dental caries with diet. This statement, I know, will very likely be challenged, but is it not reasonable to believe that it is going to be difficult after decay has formed to correct it with diet? If we are to accomplish our best results in this field, it must be before the dentition is formed. I believe, however, that we are on the right track and that the proper vitamin will be found that will go a long way toward the elimination of dental caries. Today we are face to face with the problem of treating these children, and I am convinced that the best time to begin dental treatment is in the third or fourth year, dependent entirely upon the child. Prophylactic treatment should begin at this time, getting the child dental conscious and getting him away from the fears that so often are instilled into children about dentists and doctors. Frequently we find dental caries as early as the second or third year. These cavities can be filled successfully, and the teeth can be retained until they are lost at the proper time. We too frequently do not come in contact with these children until later years, and then in many cases it is too late to prevent the loss of these deciduous teeth. I have not yet been able to believe that abcessed deciduous teeth can be treated and the root canals filled satisfactorily. My opinion is that it is much better to extract these teeth, and where necessary and possible to place retaining appliances to prevent the collapse of the arches or the impaction of permanent teeth.

Time will not permit me to dwell on any particular phase of this subject, and only the high points will be touched. Filling materials are largely a matter of choice. I have found amalgam to be most successful. In former years much copper amalgam was used, but in recent years, because of the lack of strength and durability it has been gradually losing favor (in my opinion). Where a cavity is sufficiently deep, lining it with cement and placing amalgam on that would be more practicable. In many instances there are cavities in which all the decayed tooth structure cannot be removed. I believe that we are often justified in lining the cavity with silver cement and then inserting the filling material on top of that. This I think is particularly true in a second deciduous molar. To save it for as long as six months or a year will often permit the eruption of the first permanent molar into proper occlusion, where it can then be held by retaining appliances, whereas should this tooth be extracted within six months it will cause an impaction of the second premolar by the drifting of the first permanent molar. In those cases we are thoroughly justified in leaving decayed tooth matter, because should we attempt to remove it, an exposed pulp would be the result and probably the loss of the tooth. Some men have used the gold inlay (soft gold) successfully, and I too think it has its value because you always have a cement-lined cavity; but because of the added expense and the fact that parents have not been accustomed to the high prices for this type of work for children, it seems impracticable. Of course, there are exceptions.

Then we have the type of cavity which is extremely large; in which case cement seems to be the most practical filling material. Were it not for the fact that it is a more or less temporary filling, because of its lack of resistance to the secretions it would be classed as coming closer to the ideal as a filling material for children under ten years of age. Regardless of the filling material used, as careful dentistry should be done in these teeth as is possible. It is impossible, in many instances, to do as good work for children as for adults. The reason for this is obvious; some children are extremely nervous and high strung, and they are constantly moving about in the chair from first one position to another. They complain more easily of slight pain, and in these instances the selection of the filling material has to be considered carefully; some operators can use one material much more successfully than another. Problems of this kind may force you to use a filling material that you would otherwise prefer not to use.

I shall deal briefly with the first permanent molar, which is recognized as being of the most important teeth in the dental arch. It causes as much grief as any tooth with which we deal. It usually erupts without much trouble or discomfort, and as the child is usually taking care of its own mouth hygiene at this age, the parents do not know that such a tooth has arrived or that it should arrive.

At the beginning of this article I said that the laity had become more dental conscious, and they unquestionably have, yet it is surprising to find the number of people who do not know that this tooth is a permanent one. This tooth alone gives the dentist a wonderful opportunity to discuss with his patient the importance of dental care for children. It gives him an entrée, so to speak, to dis-

cuss all the dental problems of the child for present and future care. Every dentist should acquaint his patients (and the parents) with the fact that this tooth will erupt at the age of about six years and tell of the many pitfalls to which it may fall heir. The crown and very little of the roots ends are present at eruption. It really has no great resistance to escape the ravages of decay, and the fissures and grooves in this tooth (as well as in others) are not completely calcified upon eruption, because all the above mentioned facts are against it. Such a large percentage of these teeth decay in children that I think we are safe in saying that it is more susceptible to decay than any other tooth. If these cavities are found in their incipiency, I believe that amalgam is the preferable filling material. Before development is entirely completed, it is my opinion that it is unwise to make much extension for prevention. It would be better to refill later in a more permanent way these fissures and grooves, than to do too much extensive excavating, because of shock. Then too we should also be opening up and inviting new areas for secondary decay. Many times extensive operations on these teeth for the sake of making a more beautiful filling have been the cause of the loss of the teeth.

In closing I should like to stress the fact that although the dental schools teach that every six months is often enough for a dental examination for children, too frequently these cavities appear almost overnight in developing teeth, and they are lost within the six-month period. I should like to advocate, as I have in the past, that a regular three-month period be stressed for the examination and prophylaxis of these teeth.

DISCUSSION

Dr. J. F. Hardin, Birmingham, Ala.—The essayist has handled in only *one* sentence what the majority of us consider the big factor in practicing dentistry for children: "The average child is not difficult to handle." Dr. Bray, being so expert in this, forgets how much trouble you and I have in handling children. If we cannot handle children, then we cannot put into practice any of the valuable suggestions he has offered us. Let us then consider child psychology.

First, let us try to imagine ourselves in the child's place. Mother, father, and older brothers and sisters in the home have frequently visited the dentist and have had much to say about dreading the visit. They have, consequently, impressed the child with complaints about how Dr. Brown was so rough and hurt so badly. Little eyes and ears are always wide open, and so much talk has made a very lasting and unfavorable impression of the dentist.

An appointment is made and mother carries the child to Dr. Brown's office. Everything is new and strange, and the little heart is beating faster, and the child is wondering and recalling the terrible descriptions of the family experiences related at home. He is ushered into the presence of Dr. Brown, a total stranger.

Can you think what may be passing through the mind of this little fellow? Can we possibly get the full significance of the importance of our responsibility for the impressions he gets of dentists and dentistry on this his first visit to the dental office? This is our opportunity to make a friend, possibly many friends. But of far greater importance, when the little patient leaves the office, he or she must be a friend of dentistry and be looking forward to the next visit with pleasure. Getting acquainted is the essential thing in the first visit. Find a point of contact—laugh and play with the child. Seldom, if ever, should any work be attempted—even for two or three visits if necessary. Explain everything—always tell the child the truth. Never deceive him, either the first, second, or fortieth visit. Tell him when it is going to hurt, and especially explain the difference between feeling and hurt-

ing. One way to do this is to tap the bottom of the patient's shoe and say, "now you see you feel this but it doesn't hurt." Remind him of this often.

When we have made a trusting friend of this little fellow, then and then only, can we put into practice what Dr. Bray has so ably brought to our attention in his paper.

Dr. C. W. Lokey, Birmingham, Ala.—Dr. Bray has pointed out the great progress that children's dentistry has made in the last two decades, and especially as a diagnostic factor in general medicine. No up-to-date pediatrician or internist hesitates now to consult with the dentist in the treatment of his young patient.

From the remarks made by the essayist as to the results derived from educational propaganda whether from Amos and Andy or through more ethical channels, it is very evident we should allow no opportunity to pass to educate our patients and the public to the necessity of the care of children's teeth as well as the grown-ups'. He struck the keynote when he called attention to the part played by diet, rich in vitamins and minerals in prevention of dental decay, and I think the articles by Dr. Price in the *Dental Digest* this past year should be read and studied by every dentist and mother. While there are a great many things we do not know about the application of diet, if we will avail ourselves of the progress being made by such men as Price, Howe, McCullom and others, we can be of great help to our patients in building both healthy bodies and healthy teeth.

There has been quite a little said lately about the use of dicalcium-phosphate to supply the deficiency of calcium and phosphorus, especially when given in connection with cod liver oil. While I believe there is an improvement in some patients, it has not been tried long enough to say what to expect of it; however, it is worthy of consideration.

I wish to agree most heartily with Dr. Bray about the removal of nonvital deciduous teeth; in fact, I think any nonvital tooth is dangerous for a child to have, it is my firm belief that many a boy and girl has fallen victim to pneumonia, pyelitis, spinal meningitis and many other kindred diseases when a dead tooth was the underlying cause.

Dr. Bray's method of conservation in cavity preparation for his young patients is just another evidence of his common-sense way of rendering a service to his little patients.

There is nothing so detrimental to the dental future of these little ones as subjecting them to long, tiresome and sometimes painful operations, to say nothing of the dangerous effects of large metal restorations close to the pulp of these teeth which have not reached the stage of calcification found in older patients.

When it is necessary to remove deciduous teeth, a radiograph should be made. If it is found that the permanent tooth is not in position to retain the space, an appliance for the purpose should be placed, as recommended by the essayist.

Dr. Bray (closing discussion).—I should like to thank Dr. Hardin and Dr. Lokey for their kind discussion of this paper.

You realize, of course, that in writing this paper, the field was too broad to cover except in a general way. Many of us disagree about the different phases of a dental practice, whether it is adult or children, but it is only by these differences of opinion that we have been able to make the progress we have in dentistry.

THE IMPORTANCE OF DENTISTRY FOR CHILDREN*

FRANK F. LAMONS, D.D.S., ATLANTA, GA.

IN PRESENTING this subject, I want to discuss three reasons why I believe it is important to take care of children's teeth. These reasons are given to the parents who come into my office, and especially to those parents who are indifferent to the importance of this work. They may still remember what the dentist told *them* when *they* were children: "No use to fill them—they will soon come out, anyway." There are dentists today who still feel that way to some extent, and it is because of these dentists, and some who have gone on before, that many parents must now be convinced that dental service for children is not only important, but a real necessity in maintaining health and happiness for the children.

The three reasons why children should receive the benefit of the service we have to offer are: (1) to maintain function of the teeth—proper function—throughout life; (2) to prevent systemic disturbances and impairment of general health which follows when abscesses appear in neglected mouths; and (3) to prevent pain and suffering.

I give these reasons to parents and discuss them as fully as necessary to convince the parents of the real value of this health service.

I want to enlarge somewhat on these reasons, both to make you more enthusiastic in this phase of dentistry and to give you ammunition to convince parents who need it.

The necessity of maintaining proper function of the teeth is to me the most important, and I have put it first. No one can dispute the fact that teeth in children are necessary. No one can dispute the fact that they function properly only when all are in place with good occlusal surfaces.

As a profession, we all believe that dentistry is built on this premise. Bridges have been devised to supply function where teeth have been lost; some have been so ingenious that they have been patented and the inventors enjoy a royalty from their sale.

Artificial dentures maintain function after all the teeth have been lost, but at their best they are seldom more than 25 per cent as efficient as their natural predecessors. Indeed, the average percentage of efficiency as compared to that of natural teeth is from 3 to 8 per cent.

Fillings of all types, from the "thumb amalgam" to the anatomically correct gold inlay, or the perfectly matched porcelain restorations, are called on to maintain function according to the skill of the dentist.

Extensive pyorrhea treatments—or operations, if you prefer—are heralded as the savior of teeth, not only maintaining function but preserving the general health as well.

*Read before the Florida State Dental Association, Ocala, Fla., Oct. 27, 1933.

Analyze, if you will, the operations just mentioned, and you will probably find that they, with extractions, constitute 95 per cent of your practice. Is it not also true that they are performed chiefly to restore function and that they are required mostly for adults and not for children?

Does this mean that proper function is not important in the child's mouth? Indeed, it does not.

The deciduous teeth are just as important as the permanent teeth from the standpoint of function. They serve as masticators through the most important period of growth. The deciduous molars are normally replaced by their permanent successors between the tenth and twelfth years, and at this age growth is more than three-fourths completed.

Many parents do not realize that the deciduous teeth last that long—they have not thought of it and are surprised when you tell them. Their impression is that the eruption of the permanent anterior teeth marks the end of the deciduous teeth.

The deciduous teeth serve the growing child from two to ten years of age and beyond—over eight years in the life of the individual, and the most important ones from the standpoint of growth and development.

Few parents realize the importance of the first permanent molars. When it is pointed out that these teeth must serve through life, they are astounded. Explain the importance of this tooth to them, the necessity for taking care of it, and you will be surprised at the interest they will show. It is something new to them—a lifetime service that you are to render their child. They believe in taking care of their own teeth because they know that when lost, new teeth will not grow. The first permanent molars stand in the same relation in the child's mouth. They must be taken care of, because they have a lifelong function to perform.

In most instances, when the last deciduous molars have erupted, the child's mouth is free from decay. This is the latest time when the first dental examination should be made. From that time on, regular examinations and the correction of all defects should be made if we are to do our part in maintaining proper function of the teeth. I have found that children's mouths should be examined at least three times a year—every four months. Some will require attention more often, depending upon the susceptibility to decay. Such a program, beginning at two to two and one-half years of age, will prevent premature loss of teeth and preserve their greatest efficiency.

The teeth, as the organs of mastication, prepare food for digestion, grinding it up and mixing it with saliva. A decayed and broken-down tooth cannot grind so well as a sound one, and as a result food passes into the stomach poorly prepared. This food will not yield its full nutrient value, and this fact must play an important part in the growth of a child.

Sound teeth are more valuable to the growing child than to the adult, because adults are not only better able to chew with impaired masticating apparatus, but their digestive organs, fully formed, are better able to cope with imperfectly chewed foods.

Frederick Still, M.D., in his book on common disorders and diseases of childhood, says: "The commonest evil from decayed teeth is disordered digestion, and disordered digestion in childhood means far more interference with nutrition than it does in adult life; for in childhood nourishment is required not only for the maintenance of structure already built, but for the building of *new* structure, and failure of digestion means failure of nourishment."

I am convinced that many adults are going through life today suffering from digestive disorders which are the result of diseased teeth in childhood.

Another function of teeth which must not be overlooked is to maintain the arch form during the growth and development of the jaws. You have seen results of the premature loss of deciduous teeth where the approximating teeth have filled in the gap, affecting not only the shape of the jaws but their proper development.

To prevent systemic disturbances and impairment of general health resulting from abscesses of the deciduous teeth, is a vital problem in treating children. The dental profession as a whole is thoroughly convinced of the harmful effects of abscessed teeth on the heart, kidneys, arteries and joints; in fact, on any organ or structure of the body. But have we considered seriously the effect of abscessed deciduous teeth on the vital organs? Do we have any reason to believe or any evidence to show that focal infection will not cause the same end-results, whether in the mouth of an adult or a child?

Every gumboil in the mouth of a child indicates an abscessed tooth which is a focus of infection and should receive the same careful consideration and attention you would give if the tooth were a permanent one. If the infection cannot be cleared up, the tooth should be removed.

Pus from a gumboil or an abscessed deciduous tooth passes into the stomach or is absorbed by the blood and lymph channels. Enlarged cervical glands can easily be felt in almost every case where the child has an abscessed tooth. They definitely indicate the absorption of bacterial products from the abscess. Demonstrate this to the parents and tell them just what it means. It may cause a lesion in some vital organ not fully developed, which the individual may never outgrow.

I made cultures from teeth extracted from the mouths of children suffering from organic disease at the Children's Hospital in Atlanta. These cultures were made from the roots of deciduous teeth with fistulous openings, and in the operating room under as aseptic conditions as possible. They showed in every case mixed streptococci and staphylococci organisms.

It has been shown repeatedly that these bacteria are the common exciting organisms in focal infections. We cannot overlook this just because we are dealing with deciduous teeth. While most of the vast literature on this subject deals with the permanent teeth, the lessons to be drawn therefrom apply equally to the deciduous teeth.

Therefore, you should not find it hard to convince parents that children should have adequate care of their teeth to prevent focal infection and preserve health.

To prevent pain is always an argument for early care and for regular examinations.

A small cavity left unfilled will soon result in toothache, sometimes severe; and the consequences may be far reaching. The child will get additional sympathy and attention from the parents because of the pain, and may later find imaginary pains to get more attention. This may become a fixed habit, upsetting eventually his entire nervous system, making him one of those unhappy individuals who go from one physician to another and never get well.

A bad toothache will upset the entire household and will cause sleepless nights, not only for the child who has it, but for the rest of the family. Any parent who has spent such a night should be easily convinced that filling deciduous teeth is necessary not only to preserve function and to prevent focal infection but to prevent pain and suffering as well.

If you yourself are convinced that dental service for children is just as important as any other branch of dentistry, you will have no trouble convincing parents of its value.

Dentistry, properly done for children, is a real health service, and a forward step in preventive dentistry.

PRACTICAL MOUTH HYGIENE TRUTHS WITH RESULTS

WALTER T. MCFALL, D.D.S., MACON, GA.

MOUTH hygiene is not new; the truths are not original. The more I strive to give my most in this professional field, the more firmly convinced I become that it is the most needful, most helpful and pays the greatest dividends of any service we may render in dentistry. There is nothing new under the sun, few of us are original, and none of us is very smart in his own knowledge. Working for and talking with children are a help to any man, for a child is close to the great truths of life, his instincts have not as yet become perverted by the ways and thoughts of his elders. It is a fine thing to be like a little child—simple, trustful, hopeful, and always buoyant with promise of better days.

I shall be perfectly frank in this presentation, and, while you may not agree with all I say, I sincerely hope you will keep an open mind, that you will think seriously of these truths. The truths in mouth hygiene are manifold, and their knowledge, understanding and appreciation are daily increasing among the laity and the dental profession. We have gained certain inviolate results which shall ever live to bless our memory and efforts, for in the years ahead there will be mothers and fathers strong of body, straight of mind and courageous of soul because we did our part here and now for those who should ever be our proudest boast and great asset—the children.

Mouth hygiene truths must of necessity be divided into two parts: First, the telling of the truths to parents, teachers and children, inculcating these truths, which are as positive, exact and real as any truths, into the lives of people everywhere. Second, the practice or the correlating of the truth we have taught and told people, with honest, conscientious results in our daily practices so that they may bloom forth in the lives of people.

Is it necessary that I mention the paramount importance of prenatal dentition, the necessity for a well chosen, sufficient and balanced diet for mother and child, the utmost and continuous care of the mother's own mouth and teeth, the necessity for caring for and preserving her teeth before and during pregnancy, the clarification to those who still hesitate to do needed dental work, extractions and the like for a pregnant woman because they fear an upset from their work? Shall I mention the vast need for our cooperation with the physician in interesting and insisting all healthy mothers who possibly can, nurse their babies, telling them why? We should eternally condemn the pernicious habits of thumb-sucking, the use of pacifiers, faulty bed and rest habits, automatisms such as biting or sucking the lips, cheek or tongue. There is no age so easily handled in combating and controlling these faulty habits as infancy and early childhood. It is our work to tell the mother the important part she has in giving her baby a fair start in life by assuring him healthy, useful bones and teeth. The realization that baby has a mouth and that just in proportion as this mouth is cared for and given the attention it

needs from the time the first tooth erupts at least until adolescence, under parental watchfulness, is impressed, will we assure that child of the chance in life he should have. No child should be considered too young to be taught to care for his mouth and teeth under the parent's guidance, by the time the deciduous teeth have all erupted. These twenty teeth should normally erupt without undue stress or strain, provided the proper diet during pregnancy has been utilized and the baby is a normal youngster. Eruption of the deciduous teeth, or so-called teething, is distinctively physiologic; yet many serious symptoms of sick babies are often overlooked and neglected because mothers and doctors excuse so many of the baby's upsets with the hackneyed, untrue saying, "Baby is cutting a new tooth."

Every child should visit a dentist before he is three years of age. Those unfortunate children who have early dental trouble upon eruption of teeth, where atrophy, congenitally missing teeth, faulty coalescence of the enamel and the like are present, should be brought to the dentist earlier. I claim that the physician or dentist is just as neglectful of his duty to advise and instruct mothers and prospective mothers of the necessary early visits to the dentist of the child, as would be the obstetrician who failed to use silver nitrate in the eyes of a newborn infant.

The work of the mouth hygiene director, dental clinician, dental hygienist, teacher and nurse is not enough when the dentist is indifferent, neglectful, or fails to support right teaching with reliable indorsement and permanent, serviceable work. The dentist must of necessity ever be the hub around which all other endeavors and agencies working to teach mouth hygiene truths must revolve. I have been privileged to read papers and to present clinics before many state dental societies, and I have gone with the dentists over their mouth hygiene difficulties and problems. I am sad but honest when I say that it is my conclusion that the rank and file of dentists upon whose shoulders the profession goes forward or fails are doing more to hinder and hurt mouth hygiene, to cause doubt and confusion in the minds of the laity by indifference, failure to teach and tell parents and children, by failing to do permanent lasting work, by lying to and refusing to work for children, by apparent greed for money without giving real service in return, than is any other agency in society. I say these things because I feel the obligation of it and the very urgent need for it. What do the people of your community know of dentistry as a health service? If we continue to have the ravages of defective teeth and diseased gums with their allied sequelae, we have failed to do our task.

Since the dental profession is expected to make the next great advance in the prevention of disease, it behooves every man to do all a doctor of dental surgery should do; it behooves us to realize we are professional men with an obligation to the people. We owe it to the people to care for children, and unless we are convinced of this we betray our trust and are laborers not worthy of our hire. If I can obtain your interest in children in the dental practice, for surely we all agree mouth hygiene must begin with children and earlier, then I shall have helped you help yourself and those who need and are expecting your services. I love children. I know they are interested and eager to learn and to utilize these mouth hygiene truths. I want them to have the chance to be healthy, happy and useful.

Should I plead with dentists to make every effort to save each deciduous tooth as long as it is necessary in that mouth? When a parent comes to you as a patient,

ask and urge him to send or bring his children; it is your privilege and duty to do so. Do not wait until the child is a dental cripple and beyond helping or interesting in mouth hygiene. Childhood is life's most important age; the digestive and nervous systems are in a stage of development; and any extra work thrust upon them causes an upset and serious retardation. It is during this critical period that so many contagious and infectious diseases are encountered, and medicine is beginning to understand that the diseases of childhood are the forerunners of many diseases in later life affecting the kidneys, heart, stomach and predisposing the body for diseases of the respiratory tract. No malady of the human race affects quite so many people as do defective teeth and diseased gums. These defects may not be the most serious but they are certainly the most common defects of childhood.

Surely I should mention our responsibility in using every available agency to educate the people. What splendid work can be done through ethical, truthful newspaper publicity and questions, talks before parent-teacher associations, preschool circles, service and civic clubs, medical societies, nurses, and greatest of all, through the classroom teacher in the public schools who will and can do more to teach mouth hygiene than any one save the dentist. When a teacher understands, has helpful, truthful information, the indorsement of her superintendent or supervisor, the enthusiasm to teach children that "Knowledge without health cannot profit us," a real interest is manifested and mouth hygiene truths give real results, under their effective ministrations. There is a great need for corrected and truthful mouth hygiene literature, for too long we have depended upon paid writers for highly advertised products, dentifrice manufacturers and the like, to tell our story, and it is time to correct some of these false doctrines. Mouth hygiene programs should be for all the people, not just the underprivileged or the charity cases as so many of the programs are now conducted, because defective teeth and diseased gums are no respecters of persons. All children should be taught and helped; they should know that dentistry is a health service, a necessity and not an expense or a luxury, and I believe it is our duty to teach people that they should pay the dentist for this health service. We must understand that it is the lesson learned that counts, that this work due to its magnitude must be educational, and that we as dentists are called upon to do more than merely filling, extracting and cleaning teeth for those who are driven to us, in most instances. We should certainly interest the parent in allowing us to correct the child's whole mouth and not just to extract the one offending tooth that has kept the whole family up for several nights. The child whose whole mouth is corrected, who systematically comes for regular prophylaxes and examinations, improves his health in many ways, wins his self-respect, and actually proves that the process is cheaper in dollars and cents over a period of years.

I must mention the vast importance of filling, observing and saving the keystone of the arches, the four first permanent molars. It is too late to help these teeth at nine or ten years of age, and the more one observes and studies, the more one must conclude prophylactic odontotomy is our best test in most instances. I believe that dentists have grossly failed to study and examine the mouth as a whole, the tissues and supporting structures, the mouth as an index to the rest of the body,

and the too often overlooked lesion, inflammation and irritation to gums and mucous membranes. A field of dentistry that certainly fails to receive the proper cooperation and support it merits from the average dentist is orthodontia. Too many times the dentist has failed to recognize and refer many pronounced cases of malocclusion to the orthodontist for treatment and correction. Let us be sure no child is too young for this service, and we err seriously when we fail to call the parent's attention to needs for this service and when we fail to prepare the parent for the proper reception of orthodontia. We have often mentioned to a parent that his child needs orthodontic treatment, but we immediately kill that child's chances when we invariably say, "But it costs so much." Does it cost so much or can one estimate the cost of normal function and looks, well placed teeth in arches, a respiratory tract free from obstructions, an arch in which teeth and investing tissues are comfortable, where peridontoclasia is not invited, expected and later regretted? Can these conditions, all of which are truths, be estimated in dollars and cents?

Certainly prophylaxis correctly done and the proper home care taught and a demonstration to prove that it is understood are all important. If a dentist does not know of the importance of diet and how to apply this knowledge in dental practice, he is not only handicapping himself but wronging those whom he should serve. As I understand it, the best rule to follow is to select the right kinds of food, not what we like but what we should have, to chew this food thoroughly before swallowing it, to withhold liquids until food has been swallowed comfortably from proper mastication, then systematically and carefully to follow the home care and instruction of a dentist who is visited at least every six months, and more often if necessary. The proper understanding of diet will be a boon to mankind and will add years to our span of life and to our enjoyment and usefulness during that span of life.

So far I have been telling you of some of the truths of mouth hygiene, enough to get your interest. I shall now briefly consider the practical side, for surely one is dependent upon the other. And without the right back-up to our teaching, is there any real reason to expend our energies in this direction? I shall not take up the methods, technic, short-cuts or suggestions for handling the child in the dental chair, but rather I shall ask you to consider these fundamentals which can mean so much to the profession and to those we strive to serve.

The operation which really impresses a patient most, the one which materially shows results, is a thorough, conscientious oral prophylaxis. The patient should be shown where and why the filth, stains and food accumulate and collect in the mouth; these areas should be stained with a disclosing solution, then the improvement and results should be shown after the treatment is completed. All tartar, calcific deposits and concretions should be scaled from every surface of each tooth; the interproximal as well as the buccal, palatal and lingual surfaces should be cleaned and polished. Many men have been remiss in their duty concerning this important operation; they have too often allowed the assistant to do the job or compelled the hygienist to work too fast. I wonder how many men give a thorough prophylaxis to each patient before beginning extensive dental work, and how many just throw in a half-hearted cleaning after other restorative work has been com-

pleted, many times telling the patient, "This is free of charge," which is exactly what it is worth and fails to impress people with the importance of necessary and systematic prophylactic treatments. It is not enough to do this oral prophylactic treatment well; it is even more necessary and important that we spend time in telling patients about the correct tooth brush to be used in that mouth, then telling them the scientific truth about dentifrices, tooth whiteners and toothpastes that keep teeth from decaying and will keep them from having pyorrhea. It is our duty to set people right concerning these things. I wish I could tell you in such a manner that you would be impressed, how few people really understand and can demonstrate the correct way to brush the teeth, gums and mouth. Few are impressed by their dentist as they should be, with what home care and treatment of the mouth can and should mean in their health. Along with doing his restorative work well it is also important that the dentist teach the patient and then have the patient demonstrate that he understands the need for his cooperation and responsibility in caring for his own mouth.

Many patients go to a dentist year after year believing, because they have been assured by their dentist, that their mouth and teeth are in splendid condition, until suddenly their gums become inflamed, and often advanced cases of peridontoclasia are noted by one who really studies and observes. Cavities which might have been easily and painlessly filled years before finally expose the pulp and become probable sources of trouble due to devitalization and pulp involvement, which might easily have been prevented. We need to spend more time in examination, in diagnosis, to make study models, x-ray examinations, pulp tests, to use all agencies at our command to do our work well; for, if the next great advance in the prevention of disease rests with the dental profession, we must be ready and equipped, and must do our work thoroughly and permanently.

Cements and gutta percha as filling materials must of necessity be considered temporary treatments, for attrition and mouth fluids will soon dissolve this type of filling and leave the tooth even more hopelessly impaired than before. I defy any man to use these two filling materials and adequately restore and maintain the mesiodistal relation of teeth, which is very important if we are to give permanent teeth their best chance to erupt, and if we are to prevent gum pinches, food pockets, etc., which invariably lead to serious gum inflammation in later life. One can if one only will use best grade alloys, inlays, etc., and spend some time on the use of the matrix, the proper approximation and contour, then finish the filling as it should be finished. Pulps should be protected in every instance with bases which will not themselves irritate, and it is our business to diagnose a questionable tooth and to call the patient's attention to the condition of the tooth before we attempt to fill it permanently. I believe every cavity should be sterilized, for macroscopically you cannot tell when all decay or pathogenic bacteria have been removed.

No cavity is ever too small to fill, and no fissure which is deep enough to admit the finest explorer should be passed up for a later day. Let us truly practice preventive dentistry, and back up our mouth hygiene truths in daily practice; for, when we follow this bent, invariably we earn our own self-respect and nearly always obtain the cooperation and appreciation of our patient.

It is our duty to practice dentistry as painlessly as possible. The day has gone forever when the dentist can be ruthless, inconsiderate, or careless about his patient's comfort and feelings. The proper employment of local anesthesia is a Godsend if we will study and utilize it as such. If we all spent half as much time giving our patients the proper services as in worrying over fees, then I believe this bugaboo of fees would take care of itself better.

We should understand that simple restorative work and preventive operative work are not enough. Many other things enter into the health of the mouth, and we should be cognizant of these and should always inform our patients. Habit and custom play such a big part in our lives, and it is just as easy to start a good habit as a bad one. Many patients have bad mouth habits, many care or think of their mouths incidentally, few think or appreciate the relation of the mouth to the rest of the body. Habits of eating seem to be our chief sin; we sin against our alimentary tract, usually have constipation, fail to give the tissues and organs the proper nourishment, all because of what and the way we eat. We must teach people what they should eat, why they should eat these foods, and they must understand that they must eat what they need, not what they think they want. Like father like son was never truer than in this instance; for what dad likes in most instances the family has, whether it be good for the children or not. Meals should be served at regular times, and eating between meals should be restricted and ably directed. Candy and sweets do their greatest harm in giving a false satisfaction of fullness and of curtailing a desire for other foods which are needed. Some day we shall all employ mouth exercises for muscle training and tissue function, and we shall regard Fletcherizing as a blessing and as a necessary attribute to good health and its maintenance. We need to stress proper mastication on both sides of the mouth, to chew thoroughly, slowly and deliberately before swallowing each bolus of food. Liquids should always be withheld until food has been chewed enough to be swallowed with comfort.

And what are the results? Of course no man can say, but we can surmise, and it is not to be an idealistic rampage into the realms of make-believe or maybe-so. When these truths of mouth hygiene are both taught and practiced by the profession at large, the people, in time, will have these truths inculcated in their lives. It is entirely possible to bring the majority of children into this world with a strong, healthful, useful set of deciduous teeth, to interest these children and their parents in the proper visits to the dentist and the correct home care of the mouth and teeth. It is possible to give to people everywhere the high type of professional restorative work which the dental colleges are preparing their students to give. Contagious and infectious diseases will be materially decreased; children will be physically fit, mentally alert and in a large part morally free to avail themselves of the advantages of the educational system and will have the opportunity to become healthy men and women.

The profession of dentistry will then truly be a group of professional men, men with an awakened conscience, men who enjoy their work and are proud of their opportunities and jealous of their possibilities for making this a better world and a blessing to mankind, men who are keenly alive to the responsibility which

is theirs and who are daily doing their utmost to give children everywhere the opportunity of being healthy, happy and useful. Best of all, we shall have fulfilled the duty of the profession, and we shall materially work to eliminate the necessity for its existence. We shall have worked for the joy of serving, and shall have earned and won the satisfaction and respect that always come to every man who has served well in the opportunities for which man was created.

PREPARING TEETH FOR SCHOOL*

AT SCHOOL entrance more children suffer from bad teeth than from any other defect; each year about the same percentage of decayed teeth is found. Children with decayed and abscessed teeth cannot do good school work. Moreover, the best time for prevention has passed. After school entrance dental care is a matter of patching or pulling.

The time to prevent poor teeth is before the child goes to school. Suitable food, periodic dental care, and attention to the earliest signs of decay or irregularity will do much to preserve the teeth.

But we must go farther back than that. A solid foundation for the teeth must be laid. The teeth are developed early in prenatal life, and only through the mother—her diet, hygiene, and care to prevent infection—can we influence the growth of the hidden teeth.

It is hoped that parents will be interested in finding out just what they can do to prevent suffering for their children, which comes from impaired teeth.

The one big asset—no matter how bad the times—is health. Good health and bad teeth can never be partners. Then how are bad teeth to be prevented? As in all reforms, the earlier correction begins, the better. Perhaps all reforms should really begin with the parents, but most certainly those concerned with teeth should. For teeth have a way of beginning their work under cover, and when they do come boldly forth to the light of day their future is almost entirely determined, whether for good or bad.

THE MOTHER'S JOB

It is important for the mother to know this, and to give it sincere thought. One of the first things she should do is to have her own teeth given attention during pregnancy. Long, tiresome hours in the dental chair should be avoided, of course; but so far as it is possible, all necessary work should be done in the early months. At one time mothers thought dental trouble accompanied pregnancy as its natural companion; now mothers know that healthy teeth are their right. Any unhealthy condition on the part of the mother may cost her baby its health. Infection from diseased teeth may be carried through the blood stream, affecting the entire body. It is urgent, therefore, for the expectant mother to visit her dentist early, and keep her teeth clean and well-cared for, not only for her health, but also for her comfort.

Cleaning the teeth is not a matter of the selection of a tooth paste or powder, so much as proper selection and use of the toothbrush. A clean floor is not one whose corners have been missed by the brush or mop; the best soap and cleanest water make no difference in the result. So it is with brushing the teeth. The brush should reach every part of the tooth, front, back, chewing surface, and sides. As far as possible it should penetrate the spaces

*Copies of this booklet may be obtained from the Cleveland Child Health Association.

between the teeth. To remove material from between the teeth dental floss may be used. Then the matter of a mouth wash is to be considered. Warm water, a glass of it, in which a half-teaspoon of salt has been dissolved, is safe, cheap, and efficient.

Of course, if the teeth are to be really cleaned by the brush, the brush itself must be clean. It is well to buy three brushes at a time, and preferably ones with stiff bristles, set wide apart. If these are placed in a glass of cold salt water for a half hour before they are used the first time it will help to clean them. The bristles will be "set," and some of their original harshness will be removed. Each of these may be given its turn during the day, thus allowing enough time for each to dry before it is to be used again. A wet brush is soft, but if the bristles are of good quality they will penetrate to the places most in need of them. The teeth should be brushed at least three times a day, morning, noon, and night. But it is much wiser to do it oftener—morning and night, and after each meal.

After using the brush, rinse it under a faucet from which the water comes with quite a bit of force; all the water possible should be shaken from the brush before it is put away. It is best to stand the brush, with the handle down, in a glass until it is to be used again. Two or three brushes cared for this way, should continue to do good service for three or four months.

Merely caring for the outside of the teeth is poor housekeeping. The inside must be kept clean too, but this is not very difficult, for there the blood does the hard work. In the teeth it serves the same purpose as in other parts of the body; it carries building supplies and takes away the discarded materials. The building supplies come from the food digested, of course, and there is just as much difference in supplies for the body as there is between cement, steel, or wood for a building. The part the expectant mother has in this work, then, is selecting the best materials, that is, the best foods for herself and her unborn child. The teeth of the child begin to form approximately seven months before its birth. Clearly it has nothing to say about the kind of teeth it would like to have any more than it does for many months after birth. The mother must think for it, and select proper foods for it.

FOOD SELECTION

Two of the best tooth-forming materials are phosphates and lime. These do not sound very appetizing, do they? But milk, in foods or by itself, is not very difficult to take. Milk comes at the head of the list of foods for all ages because it fills nearly all the needs of the body. It contains lime and phosphates in proper proportions. It not only helps build teeth, but provides bone-building supplies also. A quart of milk a day, in addition to other foods, is not too much for the expectant mother. Cheese and buttermilk also contain much of the same materials that milk does.

Next most important are green vegetables, fresh fruits, eggs, and coarse cereals. Included are such specific items as whole wheat bread, oranges, grapefruit, spinach, dried figs, prunes, cauliflower, lettuce, chard, peas, string beans, tomatoes, Brussels sprouts, carrots, beets, celery, and asparagus. At least two

vegetables should be eaten each day. Fruit twice a day is none too often. And do not forget to drink water—six glasses of it daily. More will be better.

The temptations of the steaming coffeepot, and the aroma of nice juicy steaks, etc., should not be yielded to very often. Coffee or tea once a day will be no great sin. But coffee and tea are stimulants, and so are highly spiced foods. It is usually better to let the doctor decide when the body needs them. It is well, also, to avoid much fried food, cabbage, eggplant, cucumbers, radishes, corn, parsnips, and peppers. Candy, cakes, pies and much meat have a way of turning into acids in the body, and are not good for it when consumed in too great quantity. If particles of the food hide away in the teeth, the acids formed by the action of the germs may work upon the teeth as actively as little beavers.

During the first five months of pregnancy it is not necessary for the mother to eat more food than is her custom. During the last four months the amount should be increased slightly. A variety of food is the best way to insure having all the elements needed for bone and tooth building, but by no means neglect the quart of milk a day, in some form. And of course, remember, just clean teeth and good food will not do all there is to be done for the mother and her child. The physician will name other things, such as getting exercise and fresh air, having quiet good times, sleep, cheerful thoughts, and a clean body. No contractor would get far with his building if his helpers did not all work together.

INSTRUCTIONS FOR THE MOTHER

1. Eat the right foods. These include plenty of milk, fresh vegetables, eggs, fresh and cooked fruits, coarser cereals such as whole wheat, corn meal, etc. Avoid too much sweet food, meat, pastries, highly seasoned foods, tea, and coffee. Alcoholic drinks are not necessary or desirable.

2. Drink at least six glasses of water daily.

3. Keep the teeth clean. Ask your dentist for definite instructions about how to do this best. No doubt he will tell you about caring for your brushes at the same time, and which are the best kinds to use.

4. Visit your dentist early in pregnancy, and often during it. Always visit your dentist at least twice a year so he can give reasonable help in saving your teeth.

5. Do not allow yourself to get into wrong habits, such as mouth-breathing, etc.

6. Be sure of enough sleep, rest, recreation, fresh air, exercise, and general bodily cleanliness.

BABY'S JOB

The baby's job is to eat and grow. After his arrival there seems to be an endless number of demands made by this young person upon the mother; it is almost easy to forget that teeth are important then. But they are, and should continue to be. The building process continues at a great rate for a number of years, and supplying proper materials is still very important. Of

course the baby's teeth have not yet appeared, and for that reason, as well as others, milk is its most suitable food.

Most physicians agree that the breast-fed baby has a better grade of building material than has the bottle-fed baby. The shape of the jaws and manner of tooth development are determined very greatly by whether the baby is breast fed. This is just another way of saying that the growth of any part of the body depends in some degree on its use. The physician will explain this to the mother and advise her about it, as well as about the time when the baby should begin to have orange or tomato juice and cod liver oil. The average baby has need of one or more of these about the third or fourth month.

Vegetables may be added to the baby's menu when the physician advises it. When these new foods are first offered the baby, it is well to start with a very small quantity, perhaps a portion no larger than a pea. From about one year of age the average child is able to eat most vegetables. If he could look over the list suggested for his mother, he would do well to select from it. Fresh milk, fruit, and vegetables are best; zwieback or stale toast is good material for strengthening the jaws and urging the blood to do its work of hardening the gums and clearing away waste material from them. Other coarse foods act in the same way.

Teeth have been blamed for so many things they have never done! Now we are beginning to understand that while they may cause a little irritability or restlessness, they are not the cause of all the world's troubles. One reason why hard crusts are good for the baby is that they save many other things from injury, such as mother's fingers, articles of furniture, etc., at teething time. Usually there is a little inflammation and swelling where the tooth is about to appear, and the gum has a hard white or reddened, shiny surface. If the baby is excessively irritable, it is wise to consult the dentist or the family physician.

The first teeth to appear are at the front of the mouth. They come between the fifth and eighth months. The next ones may be seen any time between the eighth and tenth months, and the next appear about the time the baby is one year old, or a few months later.

If the baby is well and is given plenty of water, his mouth will need no attention until the teeth begin to appear. Then the gums and teeth may be wiped off daily; use a soft clean cloth, dipped in water in which a little salt has been dissolved. Be very gentle with it. It is well to begin brushing the child's teeth with a small soft toothbrush as early as the eighteenth month. As soon as the child is old enough, teach him to do the brushing himself. It is one of the best lessons he will ever learn. Ask the dentist how to do this the best way. You will be less likely to make mistakes if you have his advice.

All of the twenty teeth, called "temporary" because they are going to be used only a few years, usually come before the child is two and a half years old.

It is interesting to know that all the time the first twenty teeth are coming to the surface, right beneath them is another whole set. These gradually grow stronger and larger until they become so bold they push the others right out. At least, that is what seems to happen. Actually the root parts of these first teeth, if they are kept in good health so they stay as long as they should, are absorbed by the gums. At last there is only a shell of the first little teeth left standing on

the surface. The permanent teeth had started to grow before the baby was born, so you see they are slow fellows, and require good treatment to encourage them to be useful.

The best treatment to give these second teeth besides good food, and care of the gums, is care of the little temporary teeth. If the temporary teeth are not treated properly, they develop abscesses. These give off poisonous material into the blood, not only about the teeth, but to all parts of the body. This may do so much harm to the other teeth growing just beneath them as to shorten their lives even after they arrive. Although this is not the best way for the temporary teeth to behave, how else are they to let it be known they are dissatisfied?

But this is not the only bad thing they may do. If they are not well-kept, they may cause pain when they are used; the child may only half chew his food, and the large pieces cause trouble for the stomach and other parts of the body. Very painful teeth make the child unhappy too, and sometimes cause displays of temper, nervousness, etc.

If the temporary teeth become so diseased they cannot be allowed to remain in the mouth, their early loss may be the cause of the second set developing sooner than they should. When children grow too fast we call them awkward. That just describes the new teeth in such a case. They are too long in some places and too large in others, but unlike the fast-growing child, they do not have an opportunity to outgrow their appearance.

CONTAGIOUS DISEASES

There are other things than the too early loss of the temporary teeth that may cause the next set a great deal of trouble. Diseases such as scarlet fever, measles, chicken pox, tuberculosis, and rickets are likely to do harm to the teeth. Severe fevers usually accompany these diseases, and they do harm. Rickets is a disease that may come if the child is not fed the right foods, or has too little sunshine. The teeth will be slow in appearing in such a case, and will be lost early. The next set is usually late in coming, also, and that means a partially toothless period for the child, with all the bad effects already described. The child who has tuberculosis may have both sets of teeth early, but the roots of the first set are not absorbed in the usual way, and that means the second set is crooked.

In any case it is better to retain the "baby" teeth in the mouth as long as they can be kept in good health, or until the time comes when they make their own decision to go. Of course decayed "baby" teeth should be filled. But if the dentist believes the teeth will not last long after filling, it is better to have them removed.

THE BATTLE AGAINST DECAY

Just what is dental decay? It is the work of the little germs that inhabit the mouths of most of us. They go about seeking a place to rest, and usually find it in some crack, crevice, or rough spot on the tooth surface. A hiding place of which they are particularly fond is the space between the teeth. There they are fairly secure. It is difficult for the cleaning brush to reach such an out-of-the-way place, but it can be done and should be mastered. When they have

settled down to housekeeping, the little germs do not rest at all, but start work at once, so that the part of the tooth where they live becomes softened. This allows the germs to work farther down.

But they are very sly about all this. Unless the dentist has an opportunity to hunt for them, they may not be found until they have gone so far into the tooth that they reach the part called the pulp. When they go that far, they usually have a battle with some other little fellows in the blood, known as phagocytes. Sometimes one wins, and sometimes the other, but usually the dentist needs to be called to help win the war for the phagocytes. If he is called too late, the tooth is lost.

As you see, all this starts in little grooves in the teeth. Many of the "baby" teeth have these at the time they first appear. That is why it is important for the child to become acquainted with the dentist early. Dentists differ about how early that should be. Some think a two-year-old patient is not too young; some say they prefer a little later age. The best thing to do is to ask the dentist when he would like to meet the child.

This introduction of the child to the dentist is not an occasion for sorrow. If only the grown-ups would not think it necessary to boast about their dental difficulties, the child would meet the dentist in the same frame of mind as he would meet any new person. The less upset the parents are about this first trip to the dentist the easier it will be for the dentist to do his work. Certainly, in telling the child about the coming visit there should be no use of the words "pain," "fear," or "hurt." And, most of all, it is unwise to tell the child to "be brave." Really, it takes very little courage to meet one's friends.

THE FIRST PERMANENT TOOTH

Between the fifth and sixth years one of the most important events of the child's life takes place. This is the coming of a "double" tooth just back of the last "baby" tooth. You will know for certain of its arrival if you can count six teeth back from the center front of the mouth. The sixth one is the new arrival. This tooth has different names, but the most common seems to be the six-year molar. There are four of these, one on each side of both upper and lower jaws.

These teeth are important because they are the first of those that are to be lifelong companions of the child. Many times they are mistaken for some of the first set, and are not given enough attention. Too often the attitude of the parents is, "Oh, they will soon go anyway. Why bother about them?" Of course this is a very bad mistake to make. Since these teeth come first of the "second" set and have more work to do during their lives than any others, they deserve a better welcome. Once gone, they cannot be replaced. They hold so important a position that with their going the entire facial expression is changed. Besides that, they are the central ones of the grinders, so that their loss means that food is not well prepared for the stomach. During the time when the first set of teeth is disappearing and the next set is coming, these grinders remain faithful to their job—if they have been well treated. Teeth may come and teeth may go, but these should go on forever.

HABITS TO AVOID

One of the earliest formed habits is thumb-sucking. The constant pressure of the thumb against the roof of the mouth causes it to grow upward in a way that was never intended. The harm in this is that as the bones go upward they press against the floor of the nose. This causes some stoppage of the passages for breathing. Besides this, when the bones of the mouth move, they carry with them, of course, the teeth already formed in them. These teeth become crooked and misplaced, and do not match perfectly against the ones below as nature intended they should.

Mouth-breathing is another bad habit. But it is necessary to look for a cause of this. Sometimes obstructions called adenoids grow at the base of the passages from the nose to the throat, so that to get sufficient air, the child must breathe through his mouth. Sometimes two little glands (tonsils) farther down, at the place where the mouth and throat meet, become enlarged or diseased, so they make it hard for the child to breathe through his nose.

Keeping the teeth clean, supplying coarse foods for jaw development and polishing the teeth, and avoiding bad habits are not enough. Sunshine, rest, fresh air, play—all these are essential to good health. And the teeth claim their fair share of the dividends from investments in these things.

INSTRUCTIONS REGARDING THE CHILD

1. Before the baby is born, let the mother follow carefully the instructions for her own care.

2. When the baby is very young, his mouth will probably need no attention if he is given enough water daily. After the teeth begin to erupt, the gums and teeth may be wiped gently with a soft, clean cloth, dipped in salt solution. The use of the toothbrush begins about the eighteenth month.

3. See that the baby has the right foods; consult the physician about when to add solid foods to the diet; consult your own list of foods for suitable ones for the baby.

4. Do not let the child develop habits of thumb-sucking, mouth-breathing, etc.

5. Avoid contagious diseases, such as whooping cough, measles, etc.

6. Have the physician protect the baby against smallpox and diphtheria in the first year of life.

7. Introduce the child to the dentist early.

8. Keep the temporary teeth so long as they are useful, for the sake of the next set. Take especial care of the six-year molars.

9. Make sure the child has plenty of sunshine, fresh air, recreation, rest, and sleep.

In addition to all the things that have been mentioned, the best way to make sure of keeping the teeth so long as they are useful is to let the dentist inspect the teeth at least twice a year. He will be able to give good advice for their care and will make needed corrections. Waiting until the teeth ache is a very poor way to be saving. Waiting for extreme complaints from the teeth

costs more in time, money, dental materials, and pain than will frequent visits to the dentist. There are other things the dentist may prevent besides aches.

The greatest harm in crooked teeth is not their looks. They cannot fit properly against their opposites in the other jaw; they shove and push each other more and more out of place, and grind off surfaces that were meant to stand. Of course they are using up force that should be applied to grinding food. Then too, decay is more likely to start in crooked teeth. Early visits to the dentist will give him an opportunity to correct such erring teeth before they become too old and set in their ways.

At certain stages of growth many children show apparently irregular teeth which will become normal later. This can be determined only by means of x-ray pictures.

One of the best assistants the dentist has these days is the x-ray picture. Many times it is impossible to be sure about the things he suspects without it. Tiny spots in the hard outer coat of the teeth cannot be found always in their beginnings by ordinary methods. But the x-ray may find the dangerous spots, and the dentist can polish off or fill these and prevent them from growing. The modest cost of x-ray pictures is quite likely to be balanced by the difference in the amount of work and material it will require to fill these beginning cavities if they do grow large before receiving care. And this does not take into consideration the saving of pain to the child.

The price of carelessness is the loss of teeth. And the extraction of a tooth is a real operation. Soft flesh is exposed just as in any operation, and the bone is affected by the removal of the tooth root. This becomes more serious when for some reason a tooth of the permanent set has not found a place left for it in the mouth, and consequently has had to remain in the jaw, under the other teeth.

No matter for what reason a tooth must be removed, it is wise to have the child return to the dentist to be sure that healing is going on as it should, just as you would for any other operation. It is not fair to him or to the child to risk the consequences of carelessness with the wound. Different conditions of the blood or of the teeth may make the healing process slower in some cases than in others, and slow healing may not be the fault of the dentist.

JUST BEFORE SCHOOL

No matter how faithfully the job of caring for the child's teeth has been conducted by the mother, child, and dentist, it is not amiss for the child to have one last good inspection just before entering school. The summer is a good time to do it. Let the physician and the dentist make sure the child is all ready physically, at least, to attack the big problem of adjustment to an entirely new situation which he must face. Most school systems now keep pretty close watch of their pupils to see that bodily conditions do not prevent their minds from making the most of the opportunities offered. When once those troublesome little teeth are ushered into the schoolroom, the mother may well breathe a sigh of relief. Some of her burden of watchfulness will be shared by the school. But she will still have to do her part.

OPERATIVE DENTISTRY FOR CHILDREN*

GUSTAV C. TASSMAN, D.D.S., PHILADELPHIA, PA.

HOW should filling materials be classified in the order of their superiority? The finest filling material we can get today for deciduous teeth (and I am speaking of deciduous teeth at the present moment) is the cast gold inlay. There is nothing that fits our needs quite so well as the cast gold inlay, because the preparation of a deciduous tooth for a cast gold inlay is simplified; the gingival seat is not required as it is for a plastic filling material. You dovetail on the occlusal surface, and you can use a broad occlusal preparation for cast gold inlay, and square walls. There is not the danger of exposing pulpal horns as there is in the preparation of cavities for plastic filling materials. (Fig. 1.)

So we place first the cast gold inlay. In cases in which, for instance, the mandibular first deciduous molar has a distoclusal cavity and the mandibular second deciduous molar has a mesioclusal cavity, where there is a field that is very difficult for preparation, we can prepare our cavities at the same sitting. We can take impressions for indirect patterns. A casting can be made and the inlay cemented for the child at the next sitting. Two operations at one sitting are a time saver, and we have something the child cannot pull out or bite out. There is a perfectly carved occlusal surface and a perfect contact point, which is one of the most important things in the restoration of the broken down deciduous teeth.

Fig. 2, the silver amalgam filling; Fig. 3, the red copper cement. I have had marked success in using red copper cement. The secret of using cement is entirely in the spatulation. In mixing not only red copper cement, but any cement, if one will begin by adding just a few grains of powder to the liquid, enough to color the liquid, and then continue to add the very smallest amounts, one will get a copper cement filling that is very hard when set and difficult to cut with a bur. It sets slowly, which gives sufficient time to carve it and contour it. A celluloid strip may be used as a matrix band; and the celluloid strip acting as a contouring appliance at the same time gives the filling a finished polish.

It is not necessary to use pressure on red copper cement. Burnish from side to side. Burnish toward the lingual and buccal walls and away from the axial wall. The result is a filling that can be quite lasting.

Next in order are the lesser used filling materials: copper amalgam, which once was possibly the choice of most dentists for deciduous teeth; base plate gutta percha, which is still a very fine filling material for deciduous teeth—in the hands of the operator who knows how to use it, especially for anterior teeth in very young children.

*Presented at the Seventh Annual Meeting of the American Society for the Promotion of Dentistry for Children, Chicago, August 7, 1933.

Fig. 1.

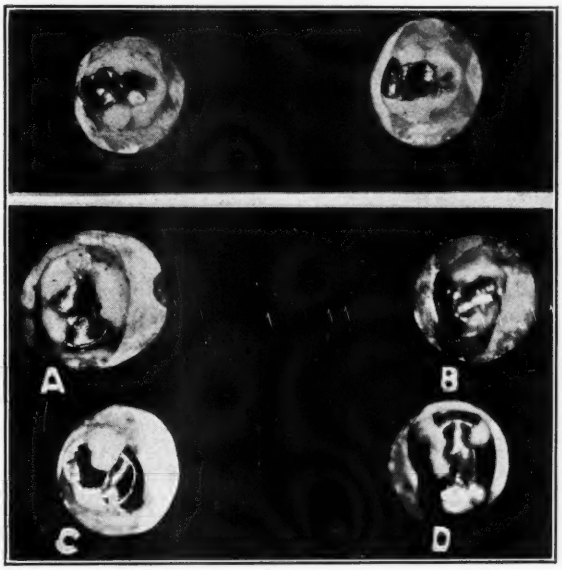

Fig. 2.

Fig. 1.—Gold inlays for deciduous teeth. The best type of restoration.

Fig. 2.—*A*, Amalgam restoration, broad occlusal surface preparation to prevent cracking of filling; *B* and *C*, silver amalgam fillings; *D*, compound silver amalgam filling, surface filled with red copper cement, buccal surface stoned and treated with silver reduction.

Fig. 3.

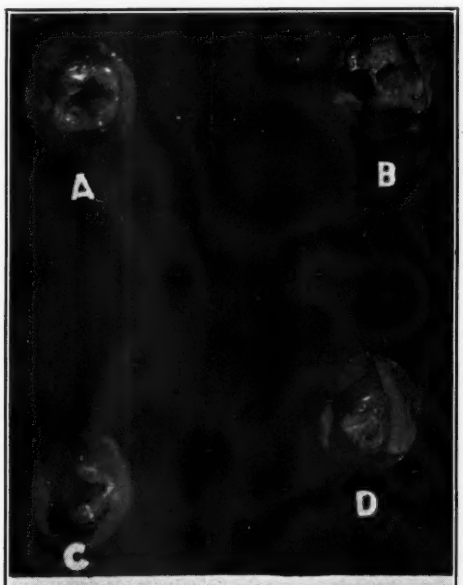

Fig. 4.

Fig. 3.—*A*, Pulp exposure due to both occlusal and interproximal cavities; *B*, interproximal cavity in deciduous molar with pulp exposure; *C*, copper cement filling contoured with celluloid strip; *D*, zinc oxide and eugenol plus asbestos fiber in a very deep-seated cavity, vital pulp.

Fig. 4.—Slice preparation in anterior tooth showing silver reduction.

Then there are other filling materials, but I am not going to mention them. I am giving enough for choice, beginning with the gold inlay, silver amalgam, red copper cement, gutta percha, zinc oxyphosphate cement, and so on down the line. As an accessory, I might mention zinc oxide and eugenol with asbestos fiber added to it.

The slice technic is used mainly for anterior teeth, and in children above the age of four. (Fig. 4.) We often find proximal cavities in the deciduous anterior teeth; i.e., the central incisors, the lateral incisors, and the canines that are very difficult to fill. The cavity preparation for those teeth is most difficult. Before the child is four, it is possible to use gutta-percha or zinc oxyphosphate cement.

I take a carborundum disk and slice down the rough margins; then I take a stone or finishing bur and smooth those margins. I then polish the surfaces. Having done that, I isolate the tooth with a little piece of rubber dam. It is necessary to isolate only one tooth. I use a small piece of rubber dam with a hole punched in it, and tie a ligature around. I then use ammoniacal silver nitrate. I hope you learn how to make it yourselves. Those who work on children should not be without it in their offices.

FORMULA FOR MAKING AMMONIACAL SILVER NITRATE

SOLUTION A.

Put 3 grams of silver nitrate crystals in a test tube.
Cover with 1 c.c. distilled water.
Heat slowly until dissolved.
Add drop by drop 2.5 c.c. of ammonia 28 per cent.
Pour off clear liquid in an amber container.

SOLUTION B. REDUCING AGENT.

1 c.c. of 40 per cent formalin.
3 c.c. of distilled water.
Eugenol is used as a reducing agent in cases where the pulp is vital.

I reduce that with eugenol. Eugenol is a sedative, is sufficiently penetrating to suit all our purposes. It reduces the silver in particles in the dentinal tubuli, and if that procedure is carried out regularly, as a regular program for that child, every three months, that tooth will be normally exfoliated, and in ninety-nine cases out of a hundred there will never be any more trouble with that tooth until nature does exfoliate it.

I brought along some specimens showing the silver reduction after slicing. You can plainly see how silver is reduced in these teeth with just one application. There has been only one application made on those specimens.

A procedure for the care and preservation of the first and second permanent molars is one of the most important things in the care of children's teeth.

In the care of the first and second permanent molars, the child should be seen at the age of five years or five and one-half years, and thereafter until these teeth have fully erupted. By that I mean the parent is instructed to bring the child in regularly. If this child is under your care, you want to see him periodically from the age of five and one-half right on until the second permanent molar erupts into its position in the arch. In the process of eruption,

we often find on the distal aspect of the occlusal surface of the crown that there is a gum flap which is a perfect lodgment place for food particles. In many instances, before that tooth has erupted, caries has well begun under that flap, even though there are no fissures present. To obviate this, polishing is the first thing we must do. Those surfaces have to be very thoroughly polished, and that is done with a Porte polisher and the small crescent brushes. As soon as we note the eruption of that tooth, we begin to polish it. We must keep it clean, and we insist that the parent bring the child back regularly, not every six months, not every four months, but every three months or oftener if we are going to preserve these permanent molar teeth. We polish with a Porte polisher the occlusal surfaces, the lingual, the buccal, the distal, and the mesial. Following that, we examine the occlusal surface minutely, and at this particular time we decide whether we are going to cut into the occlusal surface of the tooth and insert a metallic filling or whether nature is going to allow the tooth to go on through life without requiring the insertion of an occlusal filling. I use a No. 17 and a No. 18 explorer point, and closely examine those occlusal surfaces. If I can hook my explorer point, I open that tooth. I do not cut out every one of them. If I can hook, I cut. If I do not cut it out, I still continue to watch the tooth very carefully. In many cases, it is possible to polish out apparently vulnerable spots with finishing burs.

I have known teeth to get away from me. We have all had that condition, as you all know if you have read Hyatt. If you have not, you ought to read the article on "Observable and Unobservable Pits and Fissures" in the June, 1931, issue of the *Dental Cosmos*. I am pretty sure that is correct.

(Blackboard) If a fissure exists in the first permanent molar and food manages to pack into that fissure, you do not know and I do not know when caries will penetrate well within the crown into the dentin of the tooth. There is disintegration, and breaking down of tooth structure, and before you know it there is involvement of the pulp. That is the thing we have to be most careful of. How and when to do that remains with you. You must watch the tooth. You must watch it very, very carefully.

Fig. 5 is a reproduction of a tooth from the mouth of a child I have taken care of. I could hook an explorer in the central sulcus of the occlusal surface. I cut that out and filled it. The pink wax you see in the occlusal surface represents the restoration made in that particular tooth. That is a tooth you never can keep clean, and the child cannot keep it clean either. That is a tooth for prophylactic odontotomy.

I stumbled over the teeth shown in Fig. 6 not very long ago, two of them being from the mouth of a child nine years of age, and the one with the silver amalgam filling comes from the mouth of a child ten years of age. In all three teeth there was pulp involvement to such a point that they all had to be extracted. You can readily see that there are points of decalcification on these teeth. This child was not taken to a dentist regularly. There was no dental program laid out for him. As a consequence, through fissures that existed in these teeth the pulp through caries became involved resulting in the loss of the

teeth. These are typical cases in which you and I could do some very fine preventive work if we were to remove these points of poor calcification and insert good filling materials.

In this specimen in which you see the silver amalgam filling, I cut out a fissure on the buccal side to see how deeply it would penetrate, and you can see to what depth that fissure runs.

The one difficult thing in the world to teach the general practitioner of dentistry is the cavity preparation of deciduous molars. I remember a few years ago when I was giving a talk on this same work a man came up to me after the talk and said, "Do you know, Dr. Tassman, when a child is brought into my

Fig. 5.

Fig. 6.

Fig. 7.

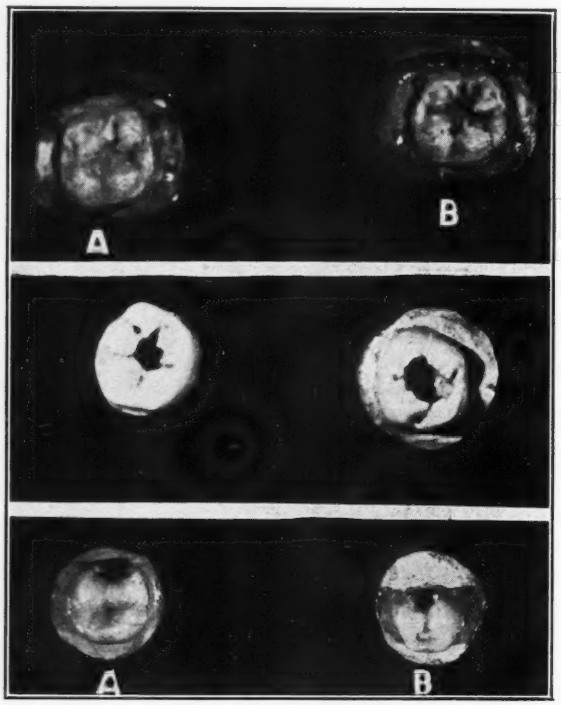

Fig. 5.—*A*, Prophylactic odontotomy is indicated in this mandibular first permanent molar; it is impossible for the child to keep the occlusal surface of this tooth clean; the No. 17 explorer was easily hooked in the fissures. *B*, Reproduction of the same tooth showing cavity preparation and filling with either silver amalgam or gold foil to prevent later pulp involvement; this is known as prophylactic odontotomy.

Fig. 6.—Poorly calcified first permanent molars. Pulp exposed by caries. Prophylactic odontotomy would probably have prevented loss of these teeth at the age of ten years.

Fig. 7.—*A*, Beginning of preparation for compound cavity in deciduous molar, demonstrating how to arrive at "broad, occlusal, boxed-in cavity preparation." *B*, Cavity preparation showing how small bur used in initial step may cause pulp exposure in deciduous molars; stones are preferable for opening up cavity.

office with a cavity in a deciduous tooth, especially a deciduous molar, I sit him down in the chair and talk to him, and all the time I fiddle around for an instrument and I think: My God, what will I do with this tooth?"

That has been the great trouble with dentistry. What will they do with the deciduous tooth?

I might almost repeat the things Dr. McFall told us this afternoon, but I want to give you, if possible, a cavity preparation that we might attempt to

follow out as nearly as possible so that we get a standardized technic for our work. One of the things we need in children's dentistry is a standardized technic.

This cavity, we shall say, exists in the mandibular or the maxillary (it does not matter which) deciduous molar. There are certain instruments that are required in the care of any of these carious molars. Those instruments are several burs, spoon excavators, stones, disks, and finishing burs. That is simple enough, and they are easy to remember.

We know we have to open up the cavity. We know we have to remove decay, and we know we must have a preparation. But more especially in the case of the mandibular deciduous molar, where the crown is very short and very often the cavity extends below the border of the gingival margin, it is difficult to get a good preparation.

We follow Black's cavity preparation of outline form, resistance form, which is very necessary, retention form, convenience, and removal of decay. We can remove decay early in the procedure if we like, and finish the preparation of our cavity thereafter. Do not expose pulps, as Dr. McFall told us earlier in the afternoon. Do not expose pulpal horns. I should much rather leave some leathery decay in that tooth and cover it over, and try to save the tooth. Do not get into pulp involvements, and do not get into root canal work in children's teeth. Get a flat gingival seat if possible, which is accomplished through the use of hatchets and very fine chisels. Use stones for opening up, then a round bur, followed by an inverted cone bur, 33½, 35, 37, and 39. That is simple enough.

We have to remember that if in the preparation of our deciduous molar we make a sharp flare on the sides, the child is going to slide that filling out at the mesial or distal marginal ridge. That is the biggest thing to remember in cavity preparation of deciduous teeth, the cracking at the proximoclusal ridge. So our preparation at that particular point must be very strong to prevent the displacement of the filling.

I have here two teeth that I brought along. In one molar tooth I took a round bur after making a preparation and sunk it into the axial wall to show how close we may come, if we are not careful, to exposing that pulpal horn.

In what way can we hope to procure better dental attention for the children of the United States? Recently in the Mouth Hygiene Association in Philadelphia a resolution was passed asking the State Board of Dental Examiners in Pennsylvania to include in their requirements a course in pedodontia in the universities of that state, making a course in pedodontia just as necessary as any other type or branch of dentistry. That, I think, is the first and paramount thought and should be with all of us who are interested in procuring better dentistry for children; a course in every dental university in the United States on pedodontia. There should be a major chair in this branch of our science, with requirements that are just as rigid as those in prosthesis, general operative dentistry, orthodontia, oral surgery, pathology, or any other branch of our study.

Second, the education not only of the child patient but also of the parent as to what we do, what we can accomplish, and what we may expect from a good,

well planned dental program. I had hoped to be able to lay that plan before you in my first question. However, I might get that opportunity at another time.

Third, the education of those dentists now practicing dentistry, who have had no particular instruction in the colleges, in children's dentistry, showing them the things Dr. McFall showed us this afternoon, thus making it easy for them rather than difficult. It is easy practice, not difficult.

Only yesterday a friend of mine said to me, "I do not like to monkey with children; I do not like to bother with them. They get on my nerves. They take my mind off other things." This man has a very fine, lucrative practice. We do not have many pedodontists. The general practitioner will have to practice children's dentistry, and it is for us to teach him. First of all, it is necessary to institute the course in the dental colleges. If we can do that, if this organization can accomplish such a thing, that is a purpose which I think would be quite worth while.

Department of Orthodontic Abstracts and Reviews

Edited by

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Dental Mutations. Abstracted from "Zusammenfassung aller bekannten Anodontenfaelle" by Dr. Werner Kohl, Zeitschrift für Zahnaerztliche Orthopaedie, Berlin, 1933, Berlinische Verlagsanstalt.

Dental mutations follow the same laws as mutations in other organs. Through variation in the genes, they act upon the tooth germs in the sense of

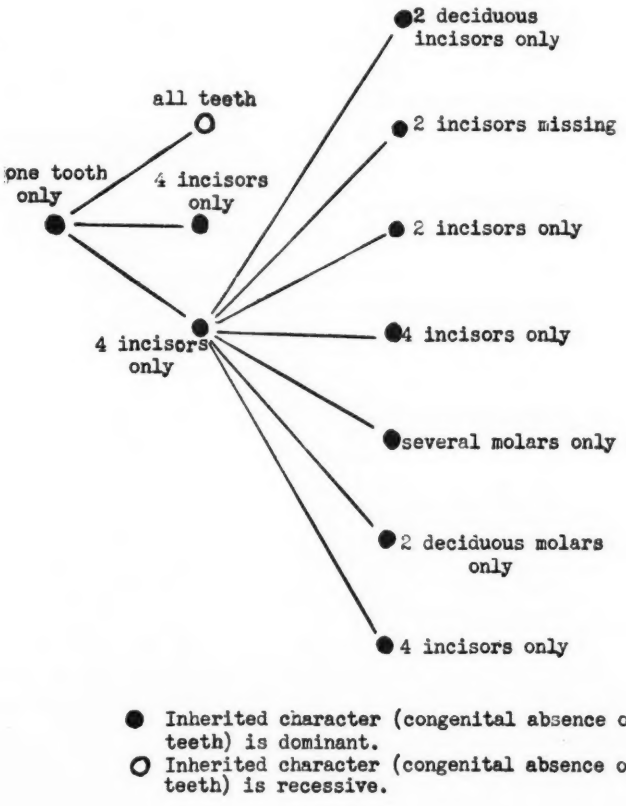

Fig. 1.

changing either their *quantity* or their *quality*. By changing their quality, teeth of unusual shape or form are produced. A change in the quantity can result either in an enlarged number of tooth germs (supernumerary teeth) or in a decreased number of them (congenitally missing teeth).

The fact that we are dealing with real mutations is brought out by a genealogic study of persons who possess only a reduced number of teeth. Mendel's law, differentiating between dominant and recessive characters, applies to these conditions. If the character of the mutation is dominant, its presence in one parent alone causes it to become evident in the offspring. If the character is recessive, it may lay dormant through many generations, until a marriage between two persons possessing the same recessive character brings it into appearance. This is the reason that the congenital absence of teeth is comparatively rare. Two genealogic tables (Figs. 1 and 2) illustrate the inheritance of those characteristics which lead to the congenital absence of teeth.

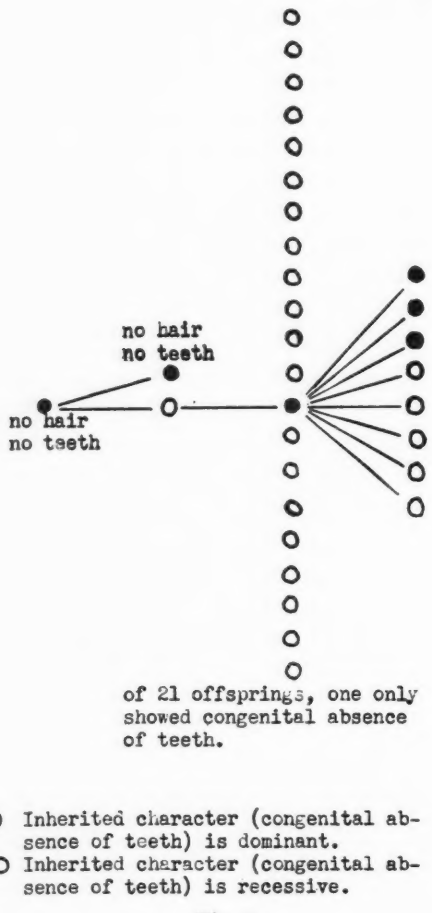
no hair
no teeth
no hair
no teeth
of 21 offsprings, one only showed congenital absence of teeth.
● Inherited character (congenital absence of teeth) is dominant.
○ Inherited character (congenital absence of teeth) is recessive.

Fig. 2.

The incidence of missing tooth germs is frequently associated with lack of hair, softness of nails, and syndactylism (condition of webs on hand or foot); all these abnormalities represent defects of the epithelial tissues, from which the skin and its appendices originate. This fact proves that, in the great majority of cases, we are dealing with a truly organic lesion. Individual tooth germs may, however, occasionally be missing, resulting from merely local disturbances; then they do not represent mutations and they do not follow Mendel's law. As a result of the absence of teeth we find that the masticatory function is diminished, and that, as a subsequence, jaw bones and skulls are under-

developed. All cases examined showed a very marked decrease in width and length of the jaws. This smallness of the jaw and its poorly developed alveolar process give the patient, even in early youth, a senile appearance around the mouth.

The Artist Looks at Dentistry. Review of "Iconagraphia odontologica" by Curt Proskauer; two hundred and thirty-two pages, one hundred and eighty-six illustrations; Berlin, Hermann Meusser.

Worthy of the Century of Progress Exhibition, where it was displayed, is this book. It contains an international collection of reproductions dealing with dental subjects; most of them are of English, French, German, Hollandish and Italian origin. They range from the fourth century B.C. to the twentieth century A.D.

From the one hundred and eighty paintings and sculptures described, covering a span of two thousand five hundred years, it is possible to reconstruct the evolution of dentistry, very much like the historian reconstructs the life of ancient cave inhabitants from the reliefs they carved in the rocks. The dentist is sketched during the performance of his professional duties by various artists and at various places; this variety in the execution of the subject throws many illuminating side lights on his professional life in times gone by. In this way, out of a collection of unconnected sketches, one great composite picture is painted before our eyes not only of the dentist himself, but also of the people he had to serve. From his signs and advertisements we find out what they expected from him and what their needs and desires were: examinations, relief of pain, extractions, artificial teeth. Little there seems to have changed in their demands; and little there seems that we can be proud of in the manner in which our professional ancestors met the requirements of their patients. But how proud can we be of ourselves, of our good training, our neat offices, our adequate instruments!

Of course, there were no dental schools in those days. Therefore the "dentist" proper was nonexistent, and four groups of professional people had undertaken the administration of dental services: the physican (*medicus*), educated in the professional schools of the antiquity and in the universities of the Middle Ages; the barber trained in the dental art during his occupation in the barber shop; the traveling tooth-drawer; and the deceitful quack. The physician of the Middle Ages was only in exceptional instances concerned with dental problems; so it came about that at a time when medicine had developed into a recognized science, dentistry was still practiced as an experimental art. However, the demand for dental services was so widespread and the figure of the dental artist so popular, that hardly an important painter has omitted portraying him on his canvas. One did it with the intent of a faithful representation, others for the purpose of humorous cartooning. The best known of the masters are Van Leyden, Amman, Bruegel, Brouwer, Teniers, Tiepolo, De Goya, Daumier, Wilhelm Busch, and Boecklin.

Some very interesting subject matters are found in this collection: a tooth extraction whereby dentist and patient are on their knees (this being regarded

as the oldest method of removing teeth, fourth century B.C.); a treatment of "pyorrhea" by the application of a red-hot iron (the modern periodontist may frown on this method, and then again, he may not); a tooth extraction where the dentist has the patient securely tied to his chair; a transplantation of a tooth from a poor and ragged wretch to a young and fashionable lady (anno 1787!); a young woman who went at night to the scaffold to break out the convict's teeth for the sake of a love charm; a husband looking gloatingly over the shoulder of the dentist who pulls out his wife's teeth (but modern dentistry does not permit spectators!); a dentist of old Rome who has removed a tooth with the point of his sword; a patient who is much disturbed because the dentist has pulled the wrong tooth; a saint who is being tortured by the extraction of his teeth.

Unusual treatment methods, gruesome extractions, fascinating plates, and lustrous false teeth, we thus find depicted, but no lovely child is presented that had its teeth straightened; the orthodontist—who prides himself on his artistic achievements, has not yet caught the artist's fancy. For the time being, he must rely upon that other great and faithful portrayer, the photographic camera.

This book appears to be particularly adapted for the waiting room library; it is interesting, sometimes humorous, and very educational (for the patient, if not for the dentist). By contrast, it brings out the value of dental services as they are rendered today.

E. N.

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EDITORIALS

Dental Care for School Children

THESE are the times of new deals, new schools, new plans; the scenery is shifting rapidly from day to day, and the professions too are feeling these trends. A new plan has been formulated by the St. Louis Dental Society to provide dental care for the school children of the city.

Tremendous thought, effort and purpose have gone into making and carrying out the plan. The readers of the Journal will be interested because it is a step toward dentistry for the mass of children. How it will work, or what its ultimate destination will be, is yet to be seen.

At the December meeting of the St. Louis Dental Society, Dr. Brandhorst, Chairman of the Committee on Public Dental Education, gave a detailed report of the survey conducted in 1933 to determine the condition of the mouths of the city's school children. In the grammar and high schools 119,000 children were examined, and the deplorable situation was disclosed that over 95 per cent of the children need dental attention. It is estimated as well that an additional 30,000 children were not examined, but it is safe to say that the percentage of dental diseases in these is approximately the same as in those examined. In other words, there are about 140,000 children in the public and parochial schools who require dental service; in addition there are about 58,000 children of preschool age, and a large percentage of them need care. Following the report the question naturally arose as to what could be done to obtain the necessary dental relief for this large number of children who are being neglected, because of either ignorance or inability to pay for service under the present economic conditions.

A Committee on Ways and Means for Promoting the Dental Care of School Children was appointed by the president of the Society to investigate and present a plan directed toward the care of these children. At the February meeting of the Society, Dr. Virgil Loeb, chairman of the committee, presented his report. It embodied a plan which was formulated with the cooperation of the City Health Division, the basis of which was to enlist the services of the members of the dental profession of this city so that children of all classes could be cared for. The children were divided into three groups: (*A*) those who are able to pay the regular fee for service; (*B*) those who are able to pay only a moderate fee; and (*C*) those who are not able to pay any fee.

For those in Class B, who are able to pay a small fee only, a maximum fee schedule was adopted: one dollar per tooth for filling; from twenty-five cents to a dollar for extractions; twenty-five cents for single radiograms, etc.

This will bring dental care within the reach of those families who are willing to pay something and do not wish to send their children to free clinics. For those not able to pay anything, the dentist will give his service free, taking care of emergency work only, and it is hoped that later the city will provide funds to pay for materials used in the care of this latter group.

The Health Division will conduct a campaign to bring this information to the attention of all schools, parent-teacher groups, social service and relief agencies, and all similar organizations. It will use the radio, the press, and lectures on the need of dental care for children. Letters will be sent by the Health Division to every ethical dentist in the city of St. Louis, asking his cooperation. The names of those responding favorably will be printed on lists according to the twenty-six census districts of the city, and such lists will be placed in the hands of all agencies dealing with children. These agencies will refer children to their own dentists or to dentists in their neighborhood who are cooperating in the plan, and each case will be classified according to the patient's ability to pay.

The report of the Committee also disclosed that slightly over 50 per cent of the children examined are afflicted with malocclusion. In making the examina-

tions, specialists in othodontia were drafted to make the orthodontic examinations; therefore, all cases of malocclusion, even though the defect might not be a major degree, were marked as malocclusion.

The entire plan is based on the Vaughan plan, which the city of Detroit has been using in medical treatment under the leadership of Dr. Henry F. Vaughan, Health Commissioner. Eleven hundred physicians in Detroit are cooperating with the Health Commissioner in a plan to care for patients who require smallpox vaccination and diphtheria immunization. Since the plan has been operating in Detroit, most of the free clinics which were formerly used for this particular type of work have been closed as treatment centers and are now being used as educational centers.

There is every reason to believe that the plan of the St. Louis Dental Society, which is the first of its kind to be applied to dentistry in any city, will work effectively in two directions. First, it should in the course of several years eliminate most of the dental defects now existing in the children of the city. Second, it has great potential benefit so far as the dental profession itself is concerned, for it will bring many patients who are able to pay the regular fees into the private dental offices; and it will establish a link with those who are able to pay only a very small fee or no fee at all, which unquestionably will lead to remunerative work in the future. It must not be forgotten that the patient of today who is able to pay nothing or only a moderate fee, is a potential pay patient of tomorrow.

H. C. P.

Professional Men and Outdoors

SPRINGTIME always prompts a thought to outdoor activity and its incidental responsibility for physical well-being. Professional men, particularly, should prize health above everything else in life because it is the essence not only of their livelihood but of their happiness. If you are one of the few individuals who pride themselves on keeping in excellent physical condition, this will interest you.

The late Dr. Frank Crane once said, "A good dose of outdoors would cure almost anything—go outdoors and get rid of nerves. Religion, faith, hope, love and courage inhabit the woods and meadows, sail the sea and seek wind and sun. Where but outdoors can you learn biology, botany, geology, astronomy and the like? Real science lives outdoors as much as leapfrog."

Combining vitamin D and sunlight with nutrition and the calcium phosphorus ratio, in either animals or human beings, is not new; nevertheless it remained for Price to emphasize its vital importance to people who have ordinary bodily ills. It remained for Price as well to investigate and make extensive reports in regard to just how these sundry things are linked up with dental caries. There is this much very definitely known about sunshine and outdoors, that rapid physical "step-up" takes place in the indoor person when he is exposed to outdoors and high sunlight. This is almost spectacularly manifested when sunshine and outdoor activities are intelligently applied and administered.

For a sharp physical quickening, add to the outdoor formula a diet properly balanced, including foods high in calcium and phosphorus content. Busy people should take advantage of these important scientific facts. They should get outdoors in the sunlight, and be purposeful about it.

In taking this outdoor prescription, another interesting thing happens to the person who has felt the softening influence of modern life. There is a definite toughening of physical, mental and moral fiber, and why? Because everything in a physical way changes in accordance with its adaptation in this biologic world. It is obvious, sensible and perfectly natural that too much synthetic living soon leaves its physical indentation.

To make an outing of any physical build-up value felt and worth the effort, it must, of course, be done in a purposeful manner; there must be a definite seeking of a goal, the pursuit of a change in the blood count, for instance, and a general "step-up" in metabolism; in other words, a serious physical approach must be made, not a mere gesture; otherwise its efficacy often fails.

Every one is interested in health because good health and that care-free feeling of abandon, that youthful exhilarated spirit of well-being, which is associated with good physical balance, mean happiness, and who is there who does not crave happiness above everything? To attain this we must seek sunshine, because sunshine and disease are always enemies; and sunshine, along with plenty of outdoors, is a great builder and preserver of men.

Those who have jangled nerves and are wearied a bit by the kaleidoscopic action of modern civilization should get outdoors. It is too bad that so few know and enjoy it. Professional men are alert to outdoor activity as a health restorative even though they do not always follow it as they should; they understand what physical rejuvenation a complete change of diet, a change of scenery and air, will do for a weary and overworked person. Physicians and dentists, especially, realize that synthetic medicinal remedies are futile for many patients below par as compared to nature's own outdoor plans when intelligently applied, and they know that medicines are only substitutes or vehicles with which to ride over rough spots.

Dentists, particularly men who work with children, should get outdoors more—play golf, fish, work in the garden. They should do it systematically week by week.

H. C. P.

NEWS AND NOTES

Southern Society of Orthodontists

The thirteenth annual meeting of the Southern Society of Orthodontists will be held at The Homestead, Hot Springs, Virginia, July 16, 17 and 18.

A cordial invitation is extended to all ethical members of the dental and medical professions.

N. F. MUIR, President,
Shenandoah Life Bldg.,
Roanoke, Va.

WILLIAM P. WOOD, JR., Secretary,
442 W. Lafayette Street,
Tampa, Fla.

Great Lakes Association of Orthodontists

The annual meeting of the Great Lakes Association of Orthodontists will be held at the Royal York Hotel, Toronto, Ontario, May 7 and 8.

A cordial invitation is extended to all ethical members of the dental and medical professions.

STANLEY A. MACKENZIE, President,
1011 Stroh Building,
Detroit, Michigan.

RALPH P. HOWARTH, Sec'y-Treas.,
1140 Hanna Building,
Cleveland, Ohio.

Kansas, Missouri and Oklahoma Tri-State Meeting

The state dental associations of Kansas, Missouri and Oklahoma will hold their annual meetings jointly at the Ararat Temple, Kansas City, Mo., May 6, 7, 8 and 9. An excellent program has been arranged, and all members of the American Dental Association are cordially invited to attend.

FRED A. RICHMOND,
305 Federal Reserve Bldg.,
Kansas City, Mo.

Association of American Women Dentists

The thirteenth annual meeting of the Association of American Women Dentists will be held at the St. Paul Hotel, St. Paul, Minn., on August 6, 1934.

A cordial invitation is extended to all women dentists.

GENEVA E. GROTH,
1301 Medical Arts Bldg.,
Philadelphia, Pa.

European Orthodontological Society

The annual meeting of the European Orthodontological Society will be held at the Hague, under the presidency of Dr. Ch. F. L. Nord, on Tuesday and Wednesday, May 21 and 22.

The program will be devoted to papers and discussion on "Prophylaxis During Orthodontic Treatment," and "The Open-Bite."

It is essential that any member wishing to contribute to the program shall present the paper in person.

This meeting follows immediately the meeting of the American Dental Society of Europe.

G. F. CALE-MATTHEWS, Secy.
60 Newhall Street
Birmingham, England.